REPORT NUMBER 61

WATER SUPPLY POLICIES
FOR
RHODE ISLAND

STATE GUIDE PLAN ELEMENT 721

SEPTEMBER 1997

Produced by the
STATEWIDE PLANNING PROGRAM
RHODE ISLAND DEPARTMENT OF ADMINISTRATION
ONE CAPITOL HILL
PROVIDENCE, RHODE ISLAND

The Rhode Island Statewide Planning Program, Department of Administration, is established by Chapter 42-11 of the *General Laws* as the central planning agency for state government. The work of the Program is guided by the State Planning Council, comprised of state, local, and public representatives and federal and other advisors.

The objectives of the Program are: (1) to prepare strategic and systems plans for the state; (2) to coordinate activities of the public and private sectors within this framework of policies and programs; (3) to assist local governments in management; finance, and planning; and (4) to advise the Governor and others concerned on physical, social, and economic topics.

Activities of the Program are supported by state appropriations and federal grants. The contents of this report reflect the views of the sponsoring state agencies, who are responsible for the accuracy of the facts and data presented herein. This may be reprinted, in part or full, with the customary crediting of the source.

ABSTRACT

TITLE: Water Supply Policies for Rhode Island

SUBJECT: Statewide water supply issues and policy

DATE: September 1997

AGENCY/ SOURCE OF COPIES: Rhode Island Statewide Planning Program
One Capitol Hill
Providence, RI 02908-5870

SERIES NO.: Report Number 61; State Guide Plan Element 721

NUMBER OF PAGES:

ABSTRACT:

WATER SUPPLY POLICY ADVISORY COMMITTEE

- Mr. Wiley J. Archer, P.E., Water Systems Consulting
- Mr. Timothy Brown, General Manager / Chief Engineer, Kent County Water Authority
- Dr. Walter S. Combs, Ph. D., Associate Director of Health, RIDOH, Environmental Health
- Mr. Juan Mariscal, Narragansett Bay Commission
- Ms. Eugenia Marks, Director of Issues and Publications, Audubon Society of RI
- Mr. Emerson Marvel, President, RI Water Works Association *(Advisory Committee Chairman)*
  (alternate) Mr. William J. McGlinn, P.E., Vice President, RI WWA
- Mr. John Milano, Administrator, RI Public Utilities Commission
  (alternate) Mr. Ray Church, Water Engineering Specialist, RI PUC
- Mr. Richard O. Rafanovic, P.E., General Manager / Chief Engineer, Providence Water Supply
- Mr. Samuel Reid, Policy Associate, Governor's Policy Office
- Mr. Paul Sams, General Manager, RI Water Resources Board
- Ms. Elizabeth Scott, Deputy Chief, RIDEM, Office of Water Resources
- Mr. Greg Stack, Budget Analyst, RI Department of Administration
- Ms. June A. Swallow, P.E., Chief, RIDOH, Division of Drinking Water Quality
- Mr. Michael Woika, Chief Engineer, Pawtucket Water Supply

STATEWIDE PLANNING PROGRAM STAFF

- Ms. Kathleen Leddy, Principal Environmental Planner
- Mr. Victor Parmentier, Supervisior, Natural Resources Section
- Ms. Susan P. Morrison, Chief, Statewide Planning Program

PREFACE

Nothing is quite so vital a resource as our drinking water. Without water, life and growth cease -- a stark reality for a planet that is covered two-thirds with water and for human bodies composed nearly two-thirds of water. Safe, potable drinking water is central to our health and well-being, as well as our economic viability. It is a component of almost every type of food and drink.

Scope of the Plan

The supply of potable water is an important part of water resources management, but it represents only one facet of a larger complex problem that must deal directly and indirectly with a multitude of water related issues. It is recognized that when examining water supply needs, it is also imperative to give attention to several of these related issues.

The key objective of this plan, however, is to develop long range policies that protect water quantity and quality in the most cost-effective and environmentally sound manner in order to protect public health, safety, and welfare. This water supply policy plan serves an important purpose in laying the foundation for the management of drinking water resources in Rhode Island.

This plan examines issues that directly affect the availability of, demand for, management and protection of drinking water, as well as the operation and maintenance of water systems to meet or exceed public health and safety standards, sustain growth and development, and improve the overall quality of life in Rhode Island. It identifies goals, formulates policies, and recommends action based on sound strategies deemed essential to maintaining our existing and protecting future water supplies.

The plan is based on a premise that recognizes drinking water as the pre-eminent use of water supply sources as it defines Rhode Island's approach to water supply issues, and describes policies and strategies for managing and protecting water supply sources and water supply systems. It acknowledges and promotes private and municipal responsibility for water supply needed to maintain water system infrastructure and necessary to the betterment of some aspects of water supply management by the state.

Relation to other State Guide Plan Elements

The plan does not create a radical change of direction from past policy premises but is based on its predecessor, *Water Supply Policies for Rhode Island*, State Guide Plan element 721, which was developed by the Division of Planning and adopted by the State Planning Council in 1988. It carries forward many of the relevant policies and themes of the 1988 policy plan, adding new policies or emphasis as the changing scale and dimension of issues surrounding water resources have evolved.

Some of the policies in this plan reinforce other elements of the State Guide Plan, as they take a comprehensive view of water supply and demonstrate a consistent approach to resolving existing problems or preventing problems in the future. Many policies, however, address new

ideas to speak to contemporary issues and coordinate responsibility for future challenges in drinking water supply management.

This plan has a companion element, *Water Supply Plan for Rhode Island*, State Guide Plan Element 722 (1991), which complements this policy element by presenting findings, conclusions, and recommendations about water supply and demand based on specific water system data and predictions over a twenty-year horizon. Element 722 addresses the more specific issues of demand calculations and projections, analysis of bureaucratic and water system needs, and priorities for implementing measures by jurisdiction or geographic region, as appropriate.

The other guide plan element that deals with drinking water is SGP Element 723, *Water Emergency Response Plan for the State of Rhode Island* (1993) which recommends steps to better prepare the state for water emergencies. The response framework is based on the existing emergency capacity of state, local, and federal entities and responds to the need to provide a coordinated approach during water crises.

Preparation and Adoption

The water supply planning process brings together those with vital and relevant concerns to communicate their interests. It often introduces diverse viewpoints and reveals new outcomes to long-standing issues, but it also provides an important perspective for utility managers, program directors, and regulatory agencies who must focus on the implementation of programs that meet the directives of state goals, policies, and legislation. This plan provides a framework for advancing more specific resource management by state agencies, the state legislature, the Water Resources Board, water suppliers, and municipalities.

Since the inception of this task, it has been clear that a policy statement of this nature will probably never be totally acceptable to all interests. Nonetheless, sound policies are necessary to guide future activities. Every attempt has been made to recognize and address all concerns so that this plan will function as the foundation for rational decisionmaking and as a guide for more specific planning and implementation strategies within Rhode Island.

This plan was adopted by the State Planning Council on September 11, 1997 following a review by the Technical Committee and a public hearing on July 21, 1997. This revised State Guide Plan element 721 effectively replaces the 1988 Water Supply Policy plan. The State Guide Plan is periodically amended or updated to reflect new data, revise policies, report progress, or adjust strategies and recommendations as appropriate. All proposed amendments are reviewed by the Technical Committee and the State Planning Council in accordance with adopted Rules of Procedure and are presented for public comment at a hearing prior to action by the Council.

Acknowledgments

This plan is the product of the efforts of hard-working and dedicated individuals who defined the major issues, presented and debated positions, and eventually formed consensus on a broad range of topics. This was not an easy task. It required time, energy, patience, many long

hours of deliberation, and a strong interest on a personal and professional level to deliver an effective and timely plan.

In this regard, the results are largely due to the efforts of the Water Supply Policy Advisory Committee that was appointed by the State Planning Council as representative of the different water supply interests of the state. The Advisory Committee members played a crucial role, contributing a diversity of expertise, advice, and thoughtful commentary to complete the plan. Sincere appreciation is extended to them on behalf of the Statewide Planning staff for their patience, time, and cooperation.

Appreciation is also extended to Jim Marvel, Superintendent of the Woonsocket Water Department, who chaired the Advisory Committee. As did many other members of the Committee, he persevered throughout the process. He also made himself available for lengthy discussions that helped to clarify controversial or technical aspects of water supply for the planning staff.

Realization of this plan is also attributable to the interest of individuals who were not advisory committee members but often attended meetings and provided additional insight. These include Maurice Trudeau, Superintendent of the Lincoln Water Commission; Ken Ayars, Division of Agriculture, Rhode Island Department of Environmental Management; Bill Falcone, Rhode Island Water Resources Board; Renu Arjal, Natural Resources Conservation Service, U.S. Department of Agriculture; and Jim Campbell, Providence Office of the U.S. Geological Survey.

The plan was prepared by Kathleen Leddy, Principal Environmental Planner, Natural Resources Section, who coordinated the planning process and wrote the plan. Guidance in these tasks was provided by Victor Parmentier, Supervising Planner. Final revisions were made by Susan Morrison, Chief, Statewide Planning. Appreciation is extended to Dan Varin for his input previous to retirement in June 1995 as Associate Director at the Division of Planning -- it was Dan's idea to initiate this plan review -- and to Robert K. Griffith, interim Acting Associate Director. Members of the Technical Committee of the State Planning Council and others who submitted comments on the draft plan are also acknowledged.

Funding was provided by state appropriations. Work was accomplished as part of task 2501, Water Supply Planning, of the Statewide Planning work program for fiscal years 1995, 1996, and 1997.

TABLE OF CONTENTS

LIST OF FIGURES & TABLES

LIST OF FIGURES

LIST OF TABLES

SUMMARY OF POLICIES

The policies presented in summary form are the result of an exhaustive evaluation of issues and debate by the Water Supply Policy Advisory Committee. Many of the issues and the resultant policies could be classified in more than one category, just as they could be implemented at more than one jurisdictional level, but based on the model established in the 1988 policy plan, the statements are classified in three general categories --- supply management, demand management, and planning and administrative management.

Supply Management Policies

S-1 Water systems shall strive to provide water that is of the highest quality practical. However, where feasible and appropriate, water shall be matched to the quality necessary for that purpose. (Reuse of water is encouraged where feasible and appropriate).

S-2 Effective watershed management and aquifer protection initiatives shall be implemented to prevent degradation and improve the quality of existing and potential water supply sources. (Measures are intended to protect water quality by managing watershed lands owned by public water systems and land in private ownership.)

S-3 Existing sources of supply shall not be abandoned as long as their water quality remains acceptable for intended uses and feasible for future reactivation. (Feasibility includes consideration of quality of the source, safe yield, cost effectiveness analysis, and other statutory and non-financial constraints.) Water suppliers shall not unreasonably be prevented from demonstrating that abandonment is in the best interest of the system.

S-4 Public access and recreational use of surface water reservoirs shall be prohibited, and involved parties shall strive to eliminate existing uses in a fair and equitable manner.

S-5 Adequacy of supplies shall be monitored on an on-going basis.

S-6 Where feasible, water suppliers shall develop and enhance system redundancy (back-up capability) and expand interconnections for emergency response.

S-7 The state shall strive to coordinate interstate and intrastate agreements that support mutual water supply and watershed protection interests.

S-8 Land use regulations shall support water quality protection for public and private supply sources including individual wells.

S-9 Municipalities shall balance the use of land and water resources in cooperation with local water supplier(s) serving their respective jurisdictions by considering:

- balancing new development with available water supply;
- encouraging development that utilizes the existing infrastructure;
- considering cumulative impacts of development within watersheds and recharge areas;

- considering safe yield and capacity of the water supply and delivery system within community comprehensive plans;
- discouraging the formation of new small water systems;
- efficiently utilizes existing supply sources;
- protecting water quality through local land use and zoning;
- or other appropriate means and methods.

S-10 Municipalities shall coordinate with appropriate state and local authorities and work toward the elimination of existing non-viable water systems.

S-11 Adequate future water supplies shall be provided through on-going short and long term planning, identification of need, evaluation of potential new water supplies, protection by advance acquisition, and other methods.

S-12 As a condition of approving new community sources, the following criteria shall be followed:
- the need for the new source based on factors such as adequacy of supply, quality of existing sources, redundancy, etc.;
- potential expansion of existing sources;
- permanent water savings resulting from demand management initiatives.

Demand Management Policies

D-1 Demand management, including the establishment of attainable and targeted water use reduction objectives, shall be an integral part of water resource management.

D-2 Water suppliers shall implement conservation programs to encourage their customers to use water efficiently.

D-3 Water suppliers shall strive to reduce peak demands.

D-4 Commercial and industrial consumers proposing new uses, or major changes of use, shall utilize appropriate technical standards for consumption projections and shall utilize cost-effective, state-of-the-art equipment for controlling water use.

Planning and Administrative Management Policies

P-1 Water for drinking andthe sustenance of life shall be the priority use while striving to protect other uses and considering public health, safety, and the overall economic well-being of the state.

P-2 Water system facilities and infrastructure shall be maintained and improved to:
- protect public health, safety, and welfare;

- protect the investment of the rate payers and proprietors;
- ensure efficient use and quantity of water supplies.

P-3 The Department of Health shall maintain primacy for and continue to enforce the requirements of the SDWA.

P-4 Water systems shall implement cross-connection and backflow prevention programs.

P-5 Non-viable systems shall be consolidated or restructured when public health is at risk, or when the public interest or greater economies of scale may be realized.

P-6 Withdrawals from both surface and groundwater sources shall be managed based on improved data taking into consideration the safe yield of surface reservoirs and the recharge rate of groundwater aquifers.

P-7 The professional development of water system employees shall be enhanced through educational and certification programs.

P-8 Water suppliers shall strive to minimize non-account water.

P-9 The Statewide Planning Program shall periodically review progress toward implementation of the policies, with information provided by the Water Resources Board and others, as required. The progress report shall also include recommendations for legislation as necessary for implementation of water supply policies.

P-10 Standardized methods for collection and reporting of data on water production, water use, and demand projections shall be established and used.

P-11 Public water systems shall have financial and operational independence to manage their resources effectively.

P-12 Measures shall be taken to ensure that water systems meet SDWA standards and maintain their technical, operational, and financial viability.

P-13 Develop an integrated database that shall include groundwater levels, precipitation, stream flow, and other data needed to determine safe yield and the recharge rates of surface supplies and groundwater aquifers to serve the needs of water system managers and the planning functions of the state.

P-14 Pricing structures shall reflect the total, just, and reasonable costs of the supply, operation, and protection of water systems, capital improvements, and replacement of infrastructure.

P-15 Technical information shall be made available to consumers to facilitate demand management and to guide the resource management activities of water systems.

P-16 Financial and other incentives may be used to promote the provision of safe drinking water, conservation, and the elimination of non-viable systems.

P-17 State and local revenues and surcharges collected from drinking water supplies shall be restricted to their intended purpose.

P-18 The state shall support the state drinking water revolving loan fund and come up with matching funds.

P-19 As an integral part of water system management, public awareness shall be promoted for:

- the importance of watershed and wellhead protection;
- nonpoint source pollution impacts;
- realization of the true costs of water; and
- the importance of efficient water use.

PART 721-1

THE MISSION

Increasingly, Rhode Island residents are recognizing the limited and vulnerable nature of clean, safe, potable water, and the importance of water to public health, the environment, and the economic well being of the state. It is unlikely that many of us consciously think of the quality and availability of our water supply each time we turn on the tap --- it is something that most of us simply take for granted. Fortunately, to date we can claim ownership of a dependable resource that is available in ample volumes, at low cost, and with exceptional quality. Accordingly, ***the mission of this plan is to establish clear, comprehensive policies to ensure that the state's short and long range water supply needs are met in the most cost-efficient and environmentally sound manner.***

1-1 Overall Goal for Water Supply Planning

We are fortunate to be in a position, ahead of the game, where we have the tools and skill to assess available resources and future demands, as well as the technology and understanding of chemistry, hydrology, and ecosystem functions needed to maintain quantity and preserve the quality of our existing water supply sources. This is especially important long range planning to undertake before reaching a zero-sum game in which increasing water for one use means taking some away from another as allowing competition to sort out the winners and losers in a game with nature is a no-win proposition for all.[1] The residual costs of political instability, personal insecurity, economic uncertainty, and ecological decline are all losing battles.

Previous efforts to achieve the state's water supply goals included utility-oriented, capital project development. The newer approach is more broadly conceived. It emphasizes efficient utilization of natural resources (i.e., watershed protection and conservation), enhanced cooperation between water systems, and coordination of water system development with local land use plans. Although the focus of the plan is toward the major suppliers of potable water, it also addresses policy geared to small water supply systems, government agencies, and municipalities having responsibility for safeguarding resources within their political boundaries.

Government officials and water specialists have recognized the need for a new approach on an international scale. The guiding principles of the global action plan developed at the 1992 Earth Summit in Rio de Janeiro, the water chapter for the Agenda 21 conference in Dublin, Ireland, and the 1993 World Bank water resources policy paper promote recognition of the links between economic development and protection of natural ecosystems -- for water to be treated as an economic good and for water planning to involve fuller public participation.[2]

---

[1] Lester R. Brown, State of the World, W.W. Norton & Co., (NY, 1996): 51.

[2] International Conference on Water and the Environment: Development Issues for the 21st Century, "The Dublin Statement and Report of the Conference," Dublin, Ire., January 26-31, 1992; United Nations, *Agenda 21: The United Nations Program of Action From Rio*, U.N. Pub, (NY, 1992); World Bank, *Water Resources Management: A World Bank Policy Paper*, (Wash., D.C., 1993).

The policies in this plan are designed to guide planning and program development for the protection, management, conservation, and development of drinking water supplies in Rhode Island. By adopting these policies, we will address water supply, demand management, and planning and administrative functions before potential problems confront us, and we will have a foundation for rational decisionmaking.

The plan acknowledges the multiplicity of freshwater resources in Rhode Island but focuses on what is termed drinking water --- although this is a broad term representing a myriad of uses including the water we drink. Drinking water is typically used in households for bathing, cleaning, cooking, and drinking; it is also used by industry and commerce for sanitation and process use. Other applications that may utilize these same sources for water supplies include recreational uses, irrigation, and providing sustenance to aquatic life and habitat.

The need for water supply policies stems from the reality that water is a finite natural resource essential to life and sensitive to degradation. Commonly held perceptions of universal availability, low price, and convenience as a conduit for waste are gone and are replaced by challenging management policies and technologies for conservation initiatives, containment of contamination, management of regional shortages, infrastructure improvements, and resolution of conflicts among uses and user groups. By incorporating these new dimensions to water supply planning, the plan emphasizes the need for cooperation and coordination. This new, cooperative relationship is particularly important as water systems strive to meet the increasingly stringent and costly requirements of maintaining a safe and adequate supply.

Water is a self-sustaining, renewable resource dependent on the hydrologic cycle and rainfall in particular to uphold its function; we are dependent on this predictability for the water we utilize as citizens of the state. What constitutes sustainable use, however, is a much more complex question and one that depends on the time of year, the unique features of individual and interconnected surface and groundwater sources, and demand.

Prudent resource management requires careful and objective evaluation of current and future needs. The plan acknowledges local water supply deficits and urges implementation of conservation measures and improved system and infrastructure efficiencies by water suppliers. Recognizing the hydrologic interconnection of surface and groundwater in water supply planning, the plan encourages local and regional responses to provide watershed and recharge area protection.

The policies in this plan support the formation of a sustainable water future, with clear criteria and strategies for working toward it. The strategies, viewed as a toolbox of practical steps supporting the policies, identify specific initiatives to be achieved at local, municipal, and state levels. The objective is to maintain the integrity of the ecosystem that is the backbone of continued viability, and ensure that water is available in both sufficient water quality and quantity to meet present and future needs essential to the enjoyment and improvement of quality of life in Rhode Island.

1-2 Basic Premises

In planning for Rhode Island's future water supply, some basic premises must be accepted concerning water-related issues.

- Water is a limited resource and, as such, shall be equitably managed for all users and purposes under a process that emphasizes efficiency of use and management, protection of existing and potential supplies, and other techniques to ensure that water is available in sufficient quantity and quality to meet the state's current and future needs.

- It is in the public interest to protect the purity of present and future drinking water supplies by requiring maximum protection of reservoirs and aquifers, and to support regional efforts to manage watersheds and recharge areas of drinking water supplies.

- Although drinking water supplies are of sufficient quantity to meet our current needs, improved system management and implementation of demand management measures will support the enhanced utilization of sustainable resources to meet Rhode Island's future potable water requirements.

- As a primary caretaker for water resources, the state has a responsibility to address water resource utilization issues in a manner that adequately protects the health, safety, and welfare of the general public; continues to support growth and economic development of the state; and improves the quality of life in Rhode Island in a cost-efficient and environmentally sound manner.

- Maximizing water supply potential should not present unresolvable conflicts with competing interests; adoption of state laws and policies must consider the needs and objectives of state agencies, water suppliers, and other private and public interests.

Part 721-2

BACKGROUND

The single most important aspect of a water supply system is its water supply source(s); it is the source water that gives substance and definition to all other issues connected with water policy. A sufficient supply of water is necessary for continued economic growth, agriculture, industry, fire control, and for recreational enjoyment and maintenance of much open space and wetlands. But, water, being a renewable natural resource, has potential for meeting all of its varied demands.

This section of the plan presents an historical perspective of public water supply and water source development in Rhode Island. It defines public water systems and describes water use and availability in hydrologic terms. It also provides a brief discussion of the legislative initiatives that impact water supply by describing federal, state, and local programs and requirements that affect the management, maintenance, and use of clean, safe, and potable water. Lastly, it contains a summary of progress and actions since the 1988 Water Supply Policy Plan was adopted.

2-1 An Overview

Rhode Island has a freshwater resource inventory that includes 14 major watersheds with 140 freshwater lakes and ponds and 22 stratified drift aquifers with potential for supplying large quantities of groundwater.[3] Of these numerous lakes and ponds, only a small percentage are committed to water supply as a primary function. This water is actually drawn from several individual but interconnected lakes and ponds. An average annual 45 inches of rainfall replenishes and sustains supplies of both surface and groundwater except during extended dry periods, when various short-term strategies are locally employed to extend drinking water supplies.

The state's one million residents consume freshwater at an average rate of 50 to 75 gallons per person per day, or in excess of 20 billion gallons per year. Large freshwater aquifers supply much of the public drinking water in the southern part of the state, and surface water sources supply the greater population in the northern and central regions. Critical supply sources come from out of state as well.

Water from underground sources is generally acceptable with little or no treatment, and can be pumped directly into the community water distribution system without chemical processing. Unlike surface reservoirs, where the watershed is definable and the flow follows the visible landscape, aquifers are replenished from directions not necessarily represented by the above ground topography. Because of their location in the physical environment, surface waters are susceptible to impacts from varied anthropogenic sources, but testing and treatment allow water suppliers to maintain high-quality drinking water for their diverse customer base.

[3] Department of Environmental Management, The State of the State's Waters, 305 (b) Report, A Report to Congress, (Providence: [1994]).

Currently, the best known method of maintaining high-quality drinking water is to maintain high-quality watershed or wellhead land protection standards. Wellhead or aquifer protection requires vigilance and the ability to regulate what is being injected into the groundwater over an area that is not easily defined. For surface sources, few community systems own or control significant portions of their watersheds, and conservation is limited to areas owned or managed for resource protection. As an example, about 90 percent of the Scituate Reservoir watershed is undeveloped, but the Providence Water Supply Board owns and protects only 28 percent (16,500 acres) of it's 92.8 square mile watershed.[4] Although significant in comparison to percentages of protected land claimed by other water suppliers, the Scituate watershed is nonetheless mostly privately owned land that is subject to development and its associated water quality impacts.

The three towns (Scituate, Foster and Glocester) that comprise 98 percent of the watershed experienced unprecedented growth from 1960 to 1990. The population of the combined towns grew by 118 percent, and housing units in these communities increased by 98 percent.

Coordination and adoption of regional water quality protection standards is one of the big challenges facing us all in the next decade. Cooperation is in everyone's best interest, not only to avert conflict but to protect the environmental resources on which we depend. As the basis of life, water requires an ethic of sharing; but, as a new politics of scarcity emerges and competition builds for a limited or shrinking pool, collaboration among users will be critical to ensure practical steps to guide water management toward desired and realistic ends.[5] Additionally, new groundwater sources will be tapped for their water-yielding potential as new supply sources.

2-2 A Fresh Look at History

To get a thorough historical perspective on water resource development and use, one must look back to the 1800s when hundreds of dams were constructed to provide water for power, processing, and waste disposal to accommodate the emerging textile industry. The first public water supply system in Rhode Island went into service in 1871, piping water to Providence from the Pawtuxet River. By 1885, public supply systems had been built to serve the developed areas of Woonsocket, Newport, and Pawtucket. The headwaters of the Pawtuxet River were dammed in 1926, creating the Scituate Reservoir, still the state's largest reservoir system; and an opportunity emerged for a seemingly unlimited supply of water to serve the booming metropolis of Providence.[6]

The graph depicted in Fig. 721-2 (1) shows aggregate normal reservoir storage capacity for Rhode Island from 1880 to 1985. The Scituate Reservoir complex, owned by the Providence Water Supply Board, accounts for more than 80 percent of this surface storage capacity.[7] By

---

4 Providence Water Supply Board, Water Quality Protection Plan, [November 1995].

5 Brown, State of the World.

6 Herbert E. Johnston and Michael J. Baer, National Water Summary 1987 -- Water Supply and Use: Rhode Island, U.S. Geological Survey, Water Supply Paper 2350, p. 448.

7 Johnston and Baer, National Water Summary 1987, p. 447.

1990 approximately 760,000 of Rhode Island's nearly one million residents (76 percent) got their water from surface water supplies.

Source: Johnston and Baer, National Water Summary 1987, p. 447.

Groundwater was not extensively used for other than domestic purposes until the mid-1900s when drilling and pumping methods were improved. Since then, groundwater has been an important source of drinking water for the state's remaining 240,000 residents; this includes an estimated 32,000 served by private wells.[8] In fact, state estimates show that, although they account for only one-quarter of the population, two-thirds of Rhode Island's 39 municipalities utilize groundwater for all or a portion of their water supply needs. The Wood Pawcatuck aquifers serve portions of ten communities in southern Rhode Island (plus four in Connecticut).[9]

2-3 Hydrology

The hydrologic cycle continuously replenishes and redistributes the water on earth through precipitation, runoff, and percolation in the soil. This continuous cycle of evaporation, condensation, and precipitation makes adequate amounts of fresh surface or groundwater available.

In simple terms, the theoretical upper limit on the yield of a surface water supply system is the average annual inflow to that system. This is typically calculated as the net hydrologic inflow (stream flow and groundwater input, precipitation on the reservoir, and runoff, minus reservoir evaporation, seepage/leakage, and other losses) minus any required downstream releases. Even if a reservoir with infinite storage capacity could be constructed, its long-term yield could not exceed the average annual inflow.[10] A sustainable criterion for renewable groundwater is fairly straightforward: net extraction should not exceed recharge.[11]

In Rhode Island, withdrawals of fresh surface water are approaching the operational capacities of developed water supplies.[12] The problem can be abated through new source development, more efficient use of existing supplies, or a combination of strategies that might include allocative use or limitations on withdrawal. The evaluation of alternatives, however, requires access to accurate, comprehensive and comparative water use data. In order to be effective and efficient, data management for tracking water use must be routine, periodic, comprehensive, and consistent.[13]

Engineers or water system managers are often reluctant to provide a single value for the system safe yield, yet it is the number that they rely on for planning and making estimates of available or future supply. Decision makers often expect a single value on which to base decisions, and policies must be based on some standardized functional base. In this state, however, there is no central agency, program, or process to track water usage, and current

---

8 DEM, The State of the State's Water, [1994].

9 Department of Environmental Management, The State of the State's Water, 305 (b) Report, A Report to Congress, (Providence: [August 1992]).

10 R.M. Vogel and D.I. Hellstrom, "Long-Range Surface Water Supply Planning," Civil Engineering Practice, 1988.

11 Brown, State of the World,

12 Rhode Island Department of Administration, Division of Planning, Water Supply Policies for RI, State Guide Plan Element 721, Report 61, (Providence, [1988]).

13 M.A. Horn and P.A. Craft, Plan for Developing a Water-Use Data Program in Rhode Island, U.S. Geological Survey, Water Resources Investigations Report 90-4207, (Providence, [1991]).

legislative authority for water resources management is distributed among several agencies collecting and processing data to fulfill their own information requirements. New strategies to consolidate this piecemeal approach are identified in this plan along with policy statements that highlight both management and technical issues associated with this approach.

2-4 Public Water Supply Systems

Public supply systems withdraw, treat, and distribute water to users. They are generally classified by their water source, since it has considerable bearing on the quality of the water, the amount available, and the kind of treatment needed before distribution to the public. Surface water is available from rivers, lakes, and ponds; but smaller streams can be used if there is reliable flow.

Surface water treatment requires, at a minimum, sediment removal, filtration, and chlorination to eliminate disease-causing micro-organisms. It usually has higher operating costs and a larger investment in treatment facilities than is the case with groundwater sources. Groundwater is not typically subject to contamination except from anthropogenic sources, but protecting an aquifer can be much more problematic and requires scientific exploration of underground water flows. Several water systems are in a third category as they do not have an independent water source, but purchase water that is usually already treated from another water system or authority at wholesale prices. Their business is to distribute water, sometimes supplying additional disinfection, pumping, or storage.

A public water supply system may be publicly or privately owned and has at least 15 service connections that regularly serve 25 or more people for 60 days or more during a year. By regulation, and as depicted in Figure 721-2 (3), public systems are subdivided into two major categories: community and non-community water systems. The division is based on the type of consumer served and the frequency with which the consumer uses water. The basic distinction is that a community system serves a

residential population and a non-community system serves a non-residential population. The non-community category is further broken down into non-transient non-community, such as a school or office, and transient non-community water systems such as motels, golf courses, or restaurants.[14] Individual homes and water systems having fewer than 25 customers with their own well, spring, or surface source are considered private water systems.[15]

A comparison of public water systems versus percent of population served indicates marked similarities between national figures and those in this state. Typically in Rhode Island, as the service area becomes smaller, more water systems are involved. Currently, there are approximately 450 small public water systems in the state, providing direct or retail service to

[14] Environmental Protection Agency, Office of Water, General Public Notification for Public Water Systems, (Washington, D.C., [Sept., 1989]).

[15] Environmental Protection Agency, Drinking Water Handbook for Public Officials, Office of Water, EPA 810-B-92-016, [December 1992].

about 265,000 people.[16] Most of these public systems serve over 25 but fewer than 3,300 customers. They are primarily located in rural areas where infrastructure for wastewater and water are not available and water is primarily drawn from wells. Because of the large number of widely scattered small systems, it has traditionally been the responsibility of private property owners or municipalities to oversee operations and secure proper management of small systems.

On the other hand, a small number of public systems serve a large proportion of the population. As illustrated in Figure 721-2 (4), about one-half of the state's geographic area and about 90 percent of the state's population are served by 30 water districts. These are the largest of the community systems, and they are owned and operated by municipalities, water authorities, fire districts, and private companies.

As stated previously, of the major water systems in Rhode Island the overwhelming majority rely on their own surface water or purchase water from another surface water system. These reservoirs and the water systems they serve are listed in Table 721-2 (1). Six major systems rely primarily on groundwater and, with one exception, can be characterized as representing the smaller residential customer-based public systems.[17]

Between 1980 and 1985 the estimated total water withdrawals declined both nationally and in Rhode Island. Data also shows a drop in peak per capita use of publicly supplied water in New England from 1980 to 1985. In Rhode Island, the 1985 per capita use for domestic purposes was estimated at 67 gallons per capita per day (gpcd), well below the regional and national averages of 78 and 105 gpcd, respectively.[18]

---

16 RI Department of Health, Annual Report 1995, DRAFT, Office of Drinking Water Quality, June 1996.

17 Major groundwater suppliers are North Kingstown Water Department, South Kingstown Water, United Water of RI (Wakefield), Westerly Water Department, Pascoag Fire District, and the RI Port Authority; the RI Port Authority serves an industrial customer base.

18 A.D. Little, Water Supply Analysis for the State of RI, Baseline Water Use, [October 1990].

Table 721-2 (1)
Surface Water Reservoirs Serving Rhode Island

NAME	LOCATION	WATER SYSTEM SERVED	ACRES
Anawam Reservoir	Rehobeth, MA	Bristol County Water Co.	
Arnold Mills Res	Cumberland	Pawtucket Water Supply Bd.	
Barden Reservoir	Foster & Scituate	Prov. Water Supply Board	258
Diamond Hill Res.	Cumberland	Pawtucket Water Supply Bd.	
Easton Pond	Npt & Middletown	Newport Water Dept.	147
Gardiner Pond	Middletown	Newport Water Dept.	101.8
Green End Pond	Middletown	Newport Water Dept.	110.4
H.E. Watson Reservoir	Little Compton	Newport Water Dept.	375
Happy Hollow Pond	Cumberland	Pawtucket Water Supply Bd.	19.9
Harris Pond	Blackstone, MA	Woonsocket Water Dept.	
Kickamuit Reservoir	Warren	Bristol County Water Co.	54
Lawton Valley Reservoir	Portsmouth	Newport Water Dept.	84
Moswansicut Pond	Johnston & Scituate	Prov. Water Supply Board	279
Nelson Pond	Middletown	Newport Water Dept.	29
Nonquit Pond	Tiverton	Newport Water Dept.	178.3
North Pond	Jamestown	Jamestown Water Division	
Ponagansett Reservoir	Glocester	Prov. Water Supply Board	217
St. Mary's Pond	Portsmouth	Newport Water Dept.	116
Sands Pond	New Shoreham	Block Island Water Works	10.5
Scituate Reservoir	Scituate	Prov. Water Supply Board	3633
Shad Factory Reservoir	Rehobeth, MA	Bristol County Water Co.	
Sisson Pond	Portsmouth	Newport Water Dept.	90
Sneech Pond	Cumberland	Cumberland Water Dept.	55
South Pond	Jamestown	Jamestown Water Division	
Stafford Pond	Tiverton	Stone Bridge Fire District	476
Swansea Reservoir	Swansea, MA	Bristol County Water Co.	
Wallum Lake	Burrillville	Zambarano Memorial State Hospital	115
Westconnaug Reservoir	Foster	Prov. Water Supply Board	
Woonsocket Res. No. 1	Cumberland & N. Smithfield	Woonsocket Water Dept.	
Woonsocket Res. No. 2	Smithfield & N. Smithfield	Woonsocket Water Dept.	

Source: Rhode Island Water Resources Board, June 13, 1984.

According to the most recent USGS report on water use in Rhode Island, the total amount of freshwater withdrawn on a daily basis during 1990 was 133 mgd, down from 147 mgd in 1985.[19] Of the 1990 amount, 108 mgd was derived from surface water sources and 25.3 mgd was derived from groundwater.[20] The majority of this water is publicly supplied --a total of 102 mgd or 76 percent of all freshwater used --and serves about 93 percent of the state's population (116 mgd in 1985). Of this amount, 88.4 mgd was withdrawn from surface water sources and 13.3 mgd was withdrawn from groundwater sources.

Most of the groundwater is pumped from stratified drift aquifers through high yield wells in southern Rhode Island; the smallest withdrawals are in the East Bay area, where groundwater resources are limited.[21] Self-supplied withdrawals by domestic, commercial, industrial, mining, and agricultural users were 31.3 mgd. The largest use of self-supplied water, 11.6 mgd, was for industrial purposes and accounted for 37 percent of self-supplied water.[22] Of the 67 mgd used for household or domestic purposes, 19 percent (13 mgd) was from groundwater sources.[23]

2-5 An Overview of Federal Laws

Maintaining our freshwater resources requires careful planning strategies. While laws do not guarantee a comprehensive approach to problems, they give the government a tool to address the issues. The Safe Drinking Water Act (SDWA) of 1974 was the first and remains the primary federal legislation for the regulation of drinking water supplies. It was amended in 1986 and again re-authorized by Congress in August of 1996. Among other things, the SDWA requires the Environmental Protection Agency (EPA) to establish drinking water standards (called MCL's -- maximum contaminant levels for both primary and secondary compounds), or treatment techniques that are enforceable at public water systems.

Setting an MCL regulates the quality of drinking water at the point of use. Between 1974 and 1986, EPA regulated 23 contaminants. In 1986, Congress enacted sweeping amendments that, among other things, significantly increased the number of contaminants to be regulated. Specifically, EPA was required to set drinking water standards for 83 contaminants within three years and, after publishing a list of other candidates for regulation, set standards for at least 25 additional contaminants every three years beginning in 1991. Compliance with the Act has sometimes come with a staggering price tag, especially for small systems that cannot take advantage of economies-of-scale like larger public systems.

The SDWA amendments of 1986 also led to the implementation of the Surface Water Treatment Rule (SWTR) in 1989, which requires filtration of nearly all surface supplies or groundwater sources under the influence of surface water, disinfection, monitoring standards, and turbidity limits. Effective watershed protection programs are required for those systems with

---

19 U.S. Geological Survey, Circular 1004, "Estimated Water Use in the United States," 1988.

20 P.A. Craft, M.A. Horn, and L. Medalie, "Estimated withdrawals and use of freshwater in RI, 1990," Report 93-4150.

21 USGS, "Estimated Water Use."

22 Craft, Horn, and Medalie, "Estimated withdrawals and use of freshwater."

23 DEM, The State of the State's Water, [1994].

special exemptions from filtration and are recommended for others. Many water systems already bearing significant costs just to implement existing regulations will be hard-pressed to implement additional requirements. According to EPA estimates, water system annual compliance costs should have reached $1.4 billion by 1995.[24]

The 1996 amendments focus on zeroing-in on those contaminants that pose the greatest risk to public health, and require consideration of costs and benefits to ensure that public health is being protected in the most cost-effective manner.[25] The amendments give the EPA the flexibility to set standards at regulatory levels that balance risks, and to identify affordable treatment technologies for use by small systems.

While the regulation of contaminants and the cost of meeting drinking water requirements affect all water systems, small water systems are expected to feel the greatest impact. Small systems often lack the financial and technical resources to meet state and federal mandates; and they have particular difficulty because of their small customer base and, in some instances, water rates that do not recover the full costs of operations. These conditions affect their ability to provide adequate treatment facilities, pay for qualified operators, maintain the system infrastructure, adhere to required water quality testing and reporting requirements, and take timely corrective action when found in violation.

To address these issues, the 1996 SDWA amendments establish a new Drinking Water State Revolving Loan Fund (SRF) authorized to issue loans or grants to help water utilities improve their system compliance and further public health protection. Although the Act sets money aside for loans to disadvantaged communities, it clearly prevents the use of SRF money by "non-viable" systems or systems in "significant non-compliance" with the regulations. In order to assist small systems in attaining and maintaining compliance with the law, the amendments also authorize funds to provide training, technical assistance, and to address other capacity development issues.

Other federal laws affect water resources:

- The Clean Water Act (CWA) of 1972 brought national attention to the other end of the pipe discharges to water.

- The 1976 Resource Conservation and Recovery Act (RCRA) provides a comprehensive approach to managing solid and hazardous wastes. This act is intended to regulate the entire waste cycle from production to final disposal; evaluation and regulation of landfills are of particular importance as they have the most potential to impact water quality. The RCRA recognizes a need for monitoring, but only in the past decade has groundwater monitoring been an integral part of waste

[24] Safe Drinking Water Act Reauthorization Issues, testimony of Peter F. Guerrero to the GAO, November 1995.

[25] *The Water Source*, "The 1996 SDWA Amendments Are On Board, Ready To Roll, And Drenched In Opportunities," Volume 3, Number 1, Fall 1996.

management. RCRA, however, applies only to wastes generated after 1976, affording no monitoring or protection from sites abandoned prior to 1976 that may contain hazardous wastes and threaten water quality.

- A federal law less frequently applied in the Northeast is the Surface Mining Control and Reclamation Act of 1977. This act requires permit applications to include management techniques for operation and reclamation of a site in order to protect nearby aquifers.

- The Comprehensive Environmental Response, Compensation, Liability Act (CERCLA), also known as the Superfund Act of 1980, has provisions for clean-up of abandoned waste sites in order to prevent further contamination of groundwater. Unfortunately, discovery of these sites often occurs after pollutants have moved into water supplies creating health and environmental problems.

2-6 Legislative Initiatives of the State

Rhode Island has numerous legislative mandates related to use and protection of freshwater resources. State laws recognize that "water is vital to life and comprises an invaluable natural resource which is not to be abused by any segment of the state's population or its economic interests," ... and is a ... "critical renewable resource which must be protected to insure the availability of safe and potable drinking water for present and future needs."[26] To this end, the state has initiated many programs and management strategies to fulfill the mandates of the law and achieve a level of protection to equal the importance of this valued resource. Some of these laws, regulations, and mandates are listed below organized by the responsible agency.

Division of Planning

The Statewide Planning Program, dating back to 1963, is responsible for a comprehensive strategic planning process for the physical, economic, and social development of the state. The compilation of plans known as the State Guide Plan is a central document that integrates long range goals, policies, and plans of the state.

The Guide Plan is mandated by law (Section 42-11-10 of the General Laws). It is important that all elements of the Guide Plan are consistent with each other, to promote orderly growth and development in the state. Also, local comprehensive plans must be consistent with the Guide Plan. Although the land use plan, the economic development strategy, the greenspace plan and the nonpoint pollution plan all make mention of water supply resources, it is the Water Supply Policies (Element 721, 1988), Water Supply Plan (Element 722, 1991), and Water Emergency Response Plan (Element 723, 1993) that are most relevant to water supply. The State Planning Council, established in this law, adopts the State Guide Plan. Its staff is the Statewide Planning Program of the Department of Administration. Sections 46-15-13 and 46-15-14 of the General Laws also designate the division of planning as responsible for long-range water supply planning and planning for water emergencies. The full text of these sections of law are reproduced in Appendix B.

[26] Section 46-15.3-1.1, Section 46-15.6-2, and Chapter 46-13.1 of the General Laws.

Department of Health

State law has assigned to the Department of Health (DOH) oversight of water quality since 1926.[27] The DOH has primacy for enforcement of the federal Safe Drinking Water Act and regulations as it monitors the quality of the state's surface and groundwater drinking water sources and its approximately 480 public water systems. The DOH approves design plans for all new public water systems, new source locations, and new storage, treatment, or pumping facilities at existing public water systems.

The DOH administers the Safe Drinking Water Act (SDWA) and monitors and reports on public water system compliance with the SDWA and state regulations, including compliance with the Total Coliform Rule, the Surface Water Treatment Rule, the Lead and Copper Rule, and the Synthetic Organic Compounds Rule. Data is reviewed to ensure compliance with maximum contaminant levels and to initiate enforcement actions as warranted.

The Health Department also administers Comprehensive Performance Evaluations at all surface water treatment facilities in the state to maintain the highest degree of treatment and to optimize the filtration processes used to provide safe drinking water. Filtration optimization and proper disinfection are the best known barriers against disease causing organisms such as cryptosporidium and giardia. The DOH reviews corrosion control technologies for lead and copper that reduce the risk of exposure to consumers. Sanitary surveys[28] provide on-site inspections of public water systems and provide technical assistance to improve water treatment system operation and maintenance. Combined with on-site sampling, this presence significantly contributes to preventing water quality problems at small water systems.

Responding to the aging transmission and distribution system that may potentially affect water quality, the DOH administers the *Comprehensive Clean Water Infrastructure Act* (1993). This Act requires major water suppliers to evaluate all components of their water supply system and determine the expected life of all components. Funding mechanisms are then established to plan and systematically replace aging components.

The State Revolving Loan Fund (RLF) is jointly administered by the DOH and the Clean Water Protection Finance Agency (CWPFA) to provide funding for water quality improvements at public water systems through low interest loans to water suppliers. The rules and regulations for the RLF program, promulgated in 1994 (Chapter 46-12.8 of the General Laws), charges DOH with the responsibility for administrating aspects of the program including reviewing project eligibility, ranking, and providing technical assistance during the application process. Additionally, every five years, DOH conducts a needs survey to identify the total infrastructure needs of all public water systems over a twenty year period.

---

[27] Department of Health, Chapter 23-1 of the General Laws; Public Drinking Water Supply, Chapter 46-13 of the General Laws; Contamination of Drinking Water, Chapter 46-14 of the General Laws; Clean Water Infrastructure, Chapter 46-15.6 of the General Laws].

[28] EPA defines a sanitary survey as an on-site review, evaluation, and/or inspection of the water source(s), facilities, equipment, operations, and maintenance of a public water system for the purpose of determining its adequacy for producing and distributing safe drinking water. In RI, surveys are performed at a minimum of once every five years and more frequently for systems that have experienced water quality problems.

The certification of public drinking water supply operators is also administered by the DOH to establish minimum standards for water treatment and distribution operators of public water systems serving more than 500 persons. The DOH sits on the Board of Certifications, administers certification exams, and awards certificates to qualified operators.

In order to minimize risks to consumers the DOH provides technical assistance and sampling services during water emergencies to aid the restoration of water service and test for contamination prior to restoring water service. Testing of temporary water storage facilities and interim water supply locations maintains consistent water quality throughout such an event.

Department of Environmental Management

Cleaning up contaminated drinking water can cost millions of dollars and take many years, but obtaining alternative water supplies can also be very costly. Because it is far less expensive to prevent pollution incidents than to treat polluted water, regulations are generally enacted as preventative measures to protect water supplies. Amendments to the *Water Pollution Control Act* (Section 46-12-28 of the General Laws) of 1983 gave the Department of Environmental Management (DEM) authority to regulate and control pollution of groundwater.

The state *Groundwater Protection Act of 1985* (Chapter 46-13.1 of the General Laws) specifically authorizes the DEM to maintain and restore water quality, to classify water sources into four categories, and to conduct studies on availability and use of the state's groundwater resources. Having established standards for groundwater protection within the water quality classifications,[29] the Act authorizes the DEM to make recommendations for regional and local planning for water use and management of land resources to provide groundwater protection. Approved activities include regulating underground storage tanks (USTs), leaking USTs (LUST's), underground injection control (UIC) sites, developing groundwater classifications, a Wellhead Protection Program (1989), and other emergency response and groundwater related tasks.

One method of achieving water quality objectives is to provide the greatest protection for stratified drift aquifers that constitute actual or potential sources of public water supply. The DEM established a Wellhead Protection Program (WHPP) in 1989 to protect wells and well fields from contamination. The WHPP requires community involvement in mapping potential pollution sources within wellhead recharge areas and cites communities as the responsible entities to implement protective land use actions. Communities are encouraged to enact protective zoning ordinances and land use policies *(see Local Initiatives and Responsibility).*

Many state laws and programs decrease the potential incidence of drinking water contamination by placing limits on specific activities. For example, the *Water Pollution Control Act* regulates the discharge of pollutants into surface waters; the same protection is afforded to groundwater for disposal of industrial or commercial pollutants. The state underground injection control (UIC) program of 1984 is the principal mechanism for controlling the direct discharge of

[29] RIDEM Regulations establish four standard classifications: GAA, GA, GB and GC.

industrial and commercial wastewater to groundwater through pits, ponds, lagoons, leach fields, wells, and other means. UIC is intended to aid aquifer protection and preserve water quality in potential water supply sources.

The *Hazardous Waste Management Facilities Act* of 1982 (Section 23-19.7-4 of the General Laws) effectively prohibits or regulates the siting of new hazardous waste disposal facilities in drinking water watersheds or aquifer recharge areas (existing or potential). Likewise, state laws on Refuse Disposal (Section 23-18.9-9.1 of the General Laws) prohibits the disposal of solid waste over existing or future drinking water sources. Groundwater protection regulations also require the registration of underground storage tanks (UST's) to enable mitigation of leaking underground storage tanks (LUSTs) and stringent design and construction standards for new proposals or uses.

More recent state legislation, the *Water Supply Management Act (*Chapter 46-15.4 of the General Laws) enacted in 1992, addressed public water supply systems that comprise the state's 28 largest water suppliers (those who obtain, transport, purchase, or sell more than 50 million gallons of water per year). The Act was written specifically to carry out most of the recommendations of the "Water Supply Analysis for the State of Rhode Island" prepared by Arthur D. Little and associated consultants. The only significant recommendations not addressed in this statute are those pertaining to supply augmentation. The legislation insures that major water suppliers prepare, maintain, and carry out Water Supply Management Plans (WSMP), including emergency management components, to achieve effective and efficient conservation, development, utilization, and protection of water resources. Although each WSMP is tailored to the needs of a particular water supplier, they all meet specific regulatory requirements and therefore jointly create a complete picture of demand, consumption, available water, anticipated future demands, and a system description in a standardized format. The provisions are administered by the Watersheds Section, Water Supply Management Division of the DEM.

RI Water Resources Board

The Rhode Island Water Resources Board (WRB) is a water supply agency established by the state to ensure that sufficient water resources are available for present and future generations of Rhode Islanders. Section 46-15-1 of the General Laws directs the Board "to regulate the proper development, protection, conservation and use of the water resources of the state." Established in 1964 as the Rhode Island Water Coordinating Board, it was reorganized in 1967 by the General Assembly as the RI WRB. The Board carries out its broad program responsibility through local water supply systems located around the state.

The Board oversees planning, coordination, and development of both surface and groundwater supplies to ensure water availability and quality. Additionally, the Board may acquire sites, dams, water rights, rights of way, easements, and other property for reservoirs, groundwater wells, well sites, pumping stations, and filtration plants for the treatment and distribution of water as well as construction of water systems. The Board's new mission includes advocating for small system viability, and as a facilitator rather than a regulator, assisting with the regionalization of non-viable small water systems.

The state, through the WRB Corporate, has been collecting a water use surcharge from major suppliers since 1987 to protect the quality and safety of public water sources. The penny per 100 gallon surcharge is added to customer water bills throughout the state as allowed under the provisions of the *Rhode Island Public Drinking Water Protection Act* (Chapter 46-15.3 of the General Laws). Monies generated are used by major public water suppliers to support land acquisition for watershed protection and other projects that are directly related to protecting drinking water quality. Currently, 1938 acres have been protected through acquisition, purchase of development rights, or long term lease.[30] Funds are available to the suppliers upon approval of Water Quality Protection Plans by the Water Resources Board Corporate.

Clean Water Protection Finance Agency

In 1993, the legislature also passed an act to allow the Clean Water Protection Finance Agency (CWPFA) to create a state revolving loan fund (SRF) for drinking water projects. Although not yet capitalized, the Water Projects Revolving Loan Fund (Chapter 46-12.8 of the General Laws) would provide a perpetual source of low-cost financing for safe drinking water projects.

2-7 Local Initiatives and Responsibility

Much of the burden of implementing initiatives to protect existing and potential water supply sources lies with local communities. Most public water systems in Rhode Island are owned and operated by municipalities or other governmental bodies such as water districts, commissions, or regional authorities. Responsibility for the increasingly stringent and complex federal and state regulation of these systems falls on professional superintendents, managers, or board members with varied expertise in water system operations.

The other aspect of local input, however, involves a community's desire to address water resources in a broader context. Cities and towns are required to prepare, adopt, and maintain comprehensive plans per the 1988 *Comprehensive Planning and Land Use Regulation Act* (Chapters 45-22.2 and 45-22.3 of the General Laws). Comprehensive plans describe a vision and identify goals to promote orderly growth and development that recognizes the natural characteristics of the land, its suitability for use, and the availability of existing and proposed public and/or private services and facilities. Recommendations are identified as initiatives or action items in an implementation element of the comprehensive plan that schedules short and long range activities, and typically identifies responsible parties for each activity.

Water supply is only a part of one of nine essential components of the comprehensive plan. This component requires communities to conduct an inventory of existing and forecasted needs of their water supply systems within the services and facilities element of the plan; many, however, are described only to the extent of showing existing service areas and listing supply sources. The scope of the comprehensive plan should include an assessment of water use, pumping capacity, and availability of service, as well as identify major users, future service areas, and threats to water quality and quantity. It should demonstrate the relationship between water

[30] Personal communication with Bill Falcone, Staff Director, RI Water Resources Board, August 1997.

quality and land development, and the need to support intensely developed areas or newly zoned parcels with public water (and sewer) systems.

A community comprehensive plan is the planning document that determines how a city or town will develop over the next twenty years. It is intended to observe all the social, economic, cultural and environmental possibilities and create a vision that encompasses each in an all-inclusive manner while meeting specific requirements of the law. The ideas in the comprehensive plan are carried out through other legal means. The *Zoning Enabling Act* (Chapter 45-24 of the General Laws) of 1991 requires communities to make zoning changes that implement their comprehensive plans. Zoning ordinances must be designed to advance orderly growth and development based on the availability and capacity of existing and planned public or private infrastructure, including water supply facilities. In the absence of absolute jurisdictional control, zoning regulations offer a mechanism to mitigate impacts on resources.

Zoning for both types and intensities of land use should be related to the kind and capacity of public services available, or programmed to be available, in a particular area. Local zoning should also protect surface and groundwater from pollution and protect public investment in water systems. The law stipulates that community land use must be regulated so as to prevent hazards to public health or safety, including hazards to water supplies. A future land use map, required for the comprehensive planning process, allows the community foresight necessary to plan ahead and forecast future water supply needs.

The *Land Development and Subdivision Review Enabling Act* (Chapter 45-23 of the General Laws) of 1992 was passed with a parallel purpose to the aforementioned laws of 1988 and 1991. This law also provides that local ordinances, regulations, and actions be consistent with the comprehensive plan, and that the type and capacity of land use be related to availability of resources.

Comprehensive planning encourages the use of innovative regulations and techniques that promote the development of land while protecting our natural, cultural, and historical, and recreational resources, and achieve a balanced pattern of land uses. To this end, many communities have adopted overlay districts to prohibit particular uses considered potentially harmful to surface and groundwater where underlying aquifers are actual or potential sources of public water supply. Others have increased minimum lot size to limit groundwater contamination by septic effluent, increased buffer zones from sensitive waterbodies, banned the storage of hazardous substances, prohibited landfills and outdoor salt storage facilities, and restricted other types of development with known risks. These actions effect water quality for the population utilizing public water and those with individual wells.

One of the most significant demand management strategies, which has a tremendous potential impact on the use of water, is changes in the state Plumbing Code. Prior to 1980, there were no special water flow requirements in the code. Rhode Island adopted legislation and regulations applying to new building construction and alterations in 1980 for all residential, commercial, industrial, and institutional sectors. The changes required conservation initiatives in the form of low-flow toilets and shower heads, 3.5 gallons per flush for new toilets and a

maximum flow rate of 3 gallons per minute for shower heads. The 1990 revisions to the code changed the standards even more dramatically, reducing toilets to 1.6 gallons per flush and shower heads to 2.5 gallons per minute at 80 psi.[31]

As shown in Table 721-2 (2), the projections from implementing these structural, permanent water conservation measures effectively reduce water consumption in an average household from approximately 67 gallons per capita per day (gpcd) pre-1980 to about 48 gpcd post-1990 depending on housing type and income.[32] The Building Code is enforced at a local level by building or plumbing inspectors.

2-8 Old Issues - New Dimensions: Summary of Progress since *Water Supply Policy for RI*, 1988

Significant progress has been made since the adoption of the *Water Supply Policies for Rhode Island* in 1988. The state has taken action to implement many policies; the more prominent actions are mentioned below in chronological order:

◆ The 1988 amendments to the *Groundwater Protection Act* (1985) provide a mandate for RIDEM to remediate groundwater and develop regulatory programs to prevent contamination, and where feasible restore, drinking water quality.

◆ *Rhode Island's Comprehensive Planning and Land Use Regulation Act* (1988) was adopted as the first of three statutes that form the state growth management program. The second is the updated *Zoning Enabling Act* (1991), that facilitates growth management by broadening local powers to use innovative controls, streamline procedures, and require timely decisions. The third is the *Land Development and Subdivision Review Enabling Act* (1992), whose purpose parallels the previous acts.

◆ Two of the more popular creative growth management tools many communities have adopted as part of their comprehensive planning efforts are Groundwater Overlay Districts, which prohibit specific uses and regulate activities in groundwater recharge areas, and Watershed Protection Districts, which control densities and activities in drinking water watersheds.

◆ The establishment of the 1989 Wellhead Protection Program, administered by the DEM, protects wells and well fields from contamination.

◆ The state undertook the 1990 *Water Supply Analysis for the State of RI*, by A.D. Little, Inc. This comprehensive study evaluated statewide water supply needs and described supply, demand, and supply augmentation options.

---

[31] 1992 RI State Plumbing Code, SBC 3, Article 15, *Water Supply and Distribution*, Section P 1503.8, *Maximum Flow* a).

[32] Little, Water Supply Analysis, (Table II-2).

◆ The 1990 revisions to the Building Code require conservation initiatives in the form of low-flow toilets and shower heads.

◆ The state adopted State Guide Plan element 722, *Water Supply Plan for Rhode Island*, in December 1991 as a companion document to the 1988 *Water Supply Policies.* Based on the A.D. Little study, the plan presented data and findings on baseline water use and offered conclusions and recommendations that supported aggressive protection of existing supplies as the most cost-effective, long-term approach to managing risks, and conservation as the highest-priority component of demand management.

◆ In 1990, the legislature enabled the establishment of a comprehensive and coordinated statewide geographic information system (GIS) of land-related economic, physical, cultural, and natural resource data within the Department of Administration (Section 42-11-2 of the General Laws). GIS allows the integration of geographically referenced environmental data with databases or other information in computerized formats for display in graphs or maps. Current GIS data layers include surface and groundwater resources, wells, wellhead protection areas, water districts, water lines, and water pumping stations for public water systems.

◆ In 1991, the state legislature amended the Water Supply Management Act that required the RIDEM to establish guidelines and develop regulations for water supply management planning.

◆ The 1993 *Comprehensive Clean Water Infrastructure Act*, administered by the RIDOH, requires water suppliers to prepare, maintain, fund and implement a comprehensive program for infrastructure repair and replacement. This Act also requires water suppliers to establish a restricted fund to pay for the system improvements with user charges.

◆ The Water Projects Revolving Loan Fund was created in 1993 to finance drinking water projects including acquisition, design, planning, construction, enlargement, repair, protection or improvement of public drinking water supplies or treatment facilities, including any actions required under the SDWA. It is administered by the Clean Water Protection Finance Agency and the RI Department of Health.

◆ In 1994 the Department of Health, with assistance of the New England Interstate Water Pollution Control Commission (NEIWPCC) and the EPA, began providing staff assistance to help small water systems obtain monitoring waivers for synthetic organic chemicals. Projections are that Rhode Island water systems will save approximately $2 million in monitoring fees through program waivers.

◆ During 1995 the EPA, in cooperation with the DOH, performed a drinking water infrastructure Needs Survey to identify the capital costs of compliance with federal and state safe drinking water regulations. Results will be used to determine the federal allocation to the state revolving fund (SRF) which will, in turn, provide a low interest lending pool to drinking water systems for specific improvements.

◆ The state adopted the *Rhode Island Nonpoint Source Pollution Management Plan* as an element of the State Guide Plan in October 1995. The plan focus is on implementation strategies to reduce nonpoint pollution especially within high-priority watersheds and aquifers.

◆ Zoning ordinance amendments of 1995 (Section 45-23-53 of the General Laws) codify the official standing of water systems to comment on proposed development within 2000 feet of their watershed boundaries.

◆ The 1995 state legislature passed *An Act Pertaining to Public Water Supply Systems* (Chapter 46-30 of the General Laws), which allows voluntary annexation of small public water systems that lack the technical and financial ability to meet current and future drinking water standards. The act allows petitioning of adjacent suppliers for annexation and the allocation of capital costs, operational expenses, and management support to new customers in a fair and equitable manner.

◆ In 1995 the Department of Health initiated performance evaluations of the state's surface water treatment facilities to identify factors that may adversely impact a plant's capability to achieve optimal performance. The objective is to determine if significant improvements can be achieved without major capital investment.

◆ The 1995 state legislature passed a law to require establishment of a Board to certify operators of public water systems, *Board of Certification of Operators of Public Water Supply Facilities*, (Chapter 23-65 of the General Laws). The Department of Health is charged to implement the law and create a process for obtaining certification to insure the proper management, operation, and maintenance of water supply treatment and distribution facilities.

Part 721-3

THE PLANNING PROCESS

In order to update the 1988 policy plan, an Advisory Committee was appointed by the State Planning Council to direct the effort and provide constructive input on particular elements of the plan. The Advisory Committee was comprised of representatives from state government, water supply officials, the Water Resources Board, the Public Utilities Commission, environmental organizations, and the Narragansett Bay Commission. Also consulted were representatives of the federal government, the agricultural community, economic development, and the Rhode Island League of Cities and Towns. Working together, issues were identified, goals established, and policies drafted to ensure the quality of life we have come to know and depend on in Rhode Island.

The planning process began with the development of a mission or vision statement. Issues or problem statements were then identified and grouped in the context of three broad categories: supply management, demand management, and planning and administrative management.

The supply management category addresses water resource protection, development of new sources, and direction for local planning initiatives. Demand management is aimed at ensuring increased awareness of the importance of water conservation while encouraging technological advances to promote user efficiencies. Planning and administrative management is necessary to establish baseline standards for emergency response and preventative maintenance within the infrastructure of supply systems. This category also deals with functional responsibility for coordination and planning required for cost control, regionalization, and maintaining the viability of small systems within the state.

Each of the three major categories was further subdivided into topics as follows:

I. Supply Management
- A. Resource Protection and Supply
- B. Comprehensive Planning for Water Supply
- C. New Source Development

II. Demand Management
- A. Water Conservation and Demand Efficiency

III. Planning and Administrative Management
- A. Planning and Administration
- B. Technical Data and Financial Management
- C. Public Education

The introduction to each topic provides an overview of the problems identified by the Advisory Committee. The issue discussion is accompanied by a table that is a compendium of the most pressing problems and concerns facing water supply management in the state today. The issues were examined to see if they were related to an issue of the 1988 policy plan. It was found that a number of "old" issues remained the same or had somewhat changed in scope but also that a number of "new" issues would lead the policies on a new course of action.

Summarizing water-related issues is a difficult undertaking and responsibility for addressing these issues is shared by various levels of government, water supply managers, and private individuals and organizations. User concerns are diverse and include distinct but fundamentally related subjects like cost, watershed protection, conservation, quality, and availability.

Pertinent information from each of these components were brought to bear in defining the issues, documenting needs, developing policies, and recommending the strategies or actions that comprise the remaining part of this document. It should be noted that reaching consensus on the issues of greatest concern is often much more achievable than arriving at even general agreement on policies that would be required to address these issues. In this regard, although substantial progress has been made to advance a number of these issues, some aspects of problems remain to be addressed.

Goals were established within each category, and policies developed to address the problems and issues that had been identified. The development of meaningful policies focuses local leaders, state regulators, water suppliers, and other decision makers on how the state will meet the goals conceived in the first steps of policy formulation. A fourth element of the plan identifies on-going activities and recommends achievable means to carry out the new policy directives and are identified as strategies.

Part 721-4

SUPPLY MANAGEMENT

Introduction to the Issues

This section identifies the key areas of concern in formulating policies and strategies dealing with water supply management; Table 721-4 (1) outlines the issues in an abridged format. Resource protection, comprehensive planning, and policies for new water source development are critical elements of supply management; and as such, the policies are structured in these three categories following this discussion of issues.

The goal for supply management is intended to reflect a desired state. In this case, the supply management goal reflects a model state where water of superior quality is available in ample quantity to meet both current and future demands. This is an ambitious objective considering the open-ended time frame, but one that is within reason with prudent attention to resource protection and long-term planning. Therefore, **the supply management goal is to ensure a safe, adequate, and dependable supply of the best available drinking water to protect public health, support economic well-being, and meet resource management needs of the state now and into the future.**

In an urban, industrial society, water supply is a public function. Concentrations of water users and fluctuating precipitation levels require interdiction of the hydrologic cycle through diversion, consumption, and storage. Techniques for meeting existing and potential demands can be either structural or programmatic.

In the not so distant past, capital development projects to fund supply augmentation were the primary method of obtaining and ensuring maximum flow. Strategies concentrated on development and the internal operation and maintenance of the "hardware" of public water systems. Only in recent years has the task been expanded beyond the realm of the component parts of the system infrastructure to the consumer level, to activities concerning residents, landowners, and assessments of the cumulative activities within the watershed that may threaten water quality.

Rhode Island has historically been noted as having one of the better water supplies in the country. Drinking water violations are infrequent and water quality remains high. While pollution problems elsewhere have created an awareness of the importance of proper management, only recently has there been a proportional interest in long-range solutions. Rhode Island's groundwater regulation now equals protection previously established for surface waters, and there is new emphasis on implementation of protective standards for nonpoint sources of pollution.

Clearly, we are in no position to simply use and abuse our drinking water sources. It is not uncommon, on a national scope, to find surface water suppliers who have had to abandon their primary water sources and seek other sources because their water quality degraded over

time and failed to meet drinking water standards. These days, it costs millions of dollars to develop a new water supply, and treating polluted water may be just as expensive.

Another related issue is access and use of land protected within the watershed of surface reservoirs. Past policy, determined by individual suppliers has largely taken a conservative approach to protecting water supply sources by focusing on restrictive access within the owned watershed. These restrictions are not consistently enforced, as there are vast differences in personnel and equipment of individual water systems to maintain control. Controls beyond the ownership boundary are even more difficult. While it is unrealistic to acquire an entire watershed or recharge area of a major aquifer, land management tools can guide future activities.

The New England Water Works Association (NEWWA) recently issued a revised policy on recreational use of public water supplies.[33] The fundamental principal of the NEWWA resolution is that drinking water should be obtained from the highest quality source feasible, and every effort should be made to prevent or control pollution of that source. Although the state has legislated grandfathering of uses on some waterbodies,[34] it is essential for the state to minimize risks to public health and prohibit direct contact with the water when possible.

These new ideas reflect the realization that safeguarding sources to meet current and future needs is a product of management practices that occur within the watershed and/or groundwater recharge areas. They also appeal to a need to incorporate community initiative and public awareness into the process of comprehensive management, and to implement practical conservation initiatives to extend the utility of existing supplies.

Source water protection refers to the practical objective of preventing pollution and degradation of drinking water sources. Whether a water source is pristine or whether it has already experienced some water quality impacts, there is no time like the present to ensure it will be protected into the future. Effective supply management extends to protection of the quantity and quality of the resource and must, by the very nature of available mechanisms, include actions by state and local government.

State laws delineate the general framework and procedural requirements that must be adhered to in order to design and implement land use controls, but primary control of land use activities lies with local officials in the 39 cities and towns, who are authorized to establish land use and development regulations under state enabling acts. Some proven water resource protection tools used by municipalities are groundwater overlay districts, wellhead protection areas, and wastewater management districts. By implementing ordinances that affect activities of local landowners or residents, a community gains a sense of responsibility for their actions and a better appreciation of anthropogenic contributions to water quality.

---

[33] New England Water Works Association Surface Water Committee, Final Revised Policy, "Resolution and Policy Concerning Recreational Use of Public Water Supplies," November 1995.

[34] *Contamination of Drinking Water*, Chapter 46-14 of the General Laws.

Even with the most well-thought-out policy guidelines, the impact caused by the need for a large amount of additional supply can create an extremely difficult management situation. Whether the need comes from source contamination, expansion of a service area, or the requirements of a single new user, the problem has traditionally been resolved by replacement of the supply source, often by tying in to the Scituate Reservoir. The perceived abundance and availability of supply obviated the need to seek other solutions to water supply problems.

Today, however, the realization is different from the perceptions of the past. It is now recognized that, while we are fortunate to have high-quality water, the sources are finite and will require coordinated management in order to meet present and future needs. The era of water development that was prevalent for nearly a century is over, and the new cycle we are entering may be characterized as a period of water management.

As traditional supply sources approach full utilization, and water systems confront increasing costs for every component of their activity, more use is being made of alternatives to new source development and implementation of demand management initiatives. Some supply management policies address new source alternatives or the conditions that must exist to allow operation of a new water source. These provisions result from the idea that maximizing use of existing supplies is a more reasonable, cost-efficient, and environmentally preferred option than the exploitation of new sources, especially surface water sources.

Policies directed at this approach address the issues of abandoning existing sources, matching the quality of water to its end use, and implementing practical demand management measures before new source development. An option that offers potential opportunity is to direct supplies of non-potable quality to a lower-quality use. Although requiring an analysis and reclassification to an inactive status by the Department of Health, these well or surface sources could provide utility for certain high-consumption but low-quality uses.

By monitoring availability and coordinating system expansions with local planning initiatives, a balance will be achieved that will guide the development of new sources with long-term planning and not crisis management. On a local level, the comprehensive planning requirements direct communities to project future water demands and compare needs to the availability of supplies. This type of supply management places responsibility on community officials to coordinate with water suppliers and to balance use and demands.

Small water systems, which comprise the majority of the region's drinking water systems, primarily need help to protect the public health and to meet regulatory requirements. There is no blanket provision for state assistance to these small and very small water systems; small water systems include those with at least 15 service connections and 25 customers and are generally privately owned. Regionalization is one option among small systems, or geographically related water systems, that will help support the increasing costs of compliance and promote small system viability. Unlike problems related to quality, small system crises can sometimes be rectified by mechanical means (plumbing); the cause is frequently attributable to misuse or a lack of system maintenance. State assistance is offered to aid the resolution of public health issues,

but the water system owner is generally the responsible entity for managing the supply beyond that point.

Notwithstanding individual responsibility, it is important that some base parameters are established in state policy that address the ability to satisfy statewide and community needs. As long as there is no insurance to guarantee the long-term sustainability of existing supply, it is important to continue to identify and protect potential new sources and ensure an adequate and safe reserve should conditions dictate a need.

Improving and expanding interconnections facilitates emergency response while offering an additional safeguard during critical low water periods. Currently, several Rhode Island communities do not have sufficient water to handle an extended dry period. Many rely on short-term conservation measures to accommodate essential needs in the dry season but are lacking viable alternatives should a prolonged dry spell occur. Others are unprepared should they see increases in consumption due to growth, and still others experience shortages simply due to a combination of unusually low precipitation and the high evaporation rate that occurs in shallow reservoirs.

Piping water out of watersheds has been a common solution to this problem. In fact, the Scituate Reservoir routinely serves communities outside of its watershed; and public systems in Newport, Pawtucket, Westerly, and Woonsocket rely on source water that travels through other municipalities and other states. In emergency situations, bottled water has been distributed and temporary transmission lines have carried potable water from one supply source to another.

Although on a statewide basis there may be sufficient availability, shortages generally occur regionally. The problem is exacerbated by communities or systems that have endorsed expansions, either in land development or infrastructure, without analyzing the ability of the water supply source to accommodate new growth. Availability of water is not generally a factor in most local development proposals, and better coordination between water suppliers and local officials could improve responsible decisionmaking for approval of new development or reuse of existing parcels.

In its comprehensive plan a community must address future land use, zoning, and growth projections and evaluate the availability of potable water to residents and businesses within a 20-year planning horizon. It is important that the required water supply management plans and infrastructure plans be consistent with comprehensive plans for areas served by public water, and that water suppliers involved in the permit process for new development are able to assist communities making determinations of available water.

TABLE 721-4 (1)

SUPPLY MANAGEMENT ISSUES

AREAS OF STRATEGIC CONCERN	ISSUES
Resource Protection	• Protect watersheds/wellhead areas • Use consistent protection measures • Clean-up and prevent point and nonpoint pollution • Protect potential drinking water sources • Locate detrimental land use outside watershed, groundwater recharge, and wellhead protection areas • Land acquisition costs • Responsibility for small systems • Match quality with intended use • Maintain available supply • Withdrawals exceed safe yields • Protect supply with land use regulations • Recreational use of drinking water reservoirs • Interconnections for emergency response • Relate demand to existing supply
Comprehensive Planning	• Compatible land use with watershed protection objectives • Coordinate development with adequacy of supply • Consider individual well supplies • Water system involvement in community planning • Coordinate system expansion with local planning • Make best use of existing infrastructure • Integrate land use, zoning, and water supply planning and management
New Source Development	• Abandonment of existing supply including private wells • Maintain underutilized supplies • Evaluate alternative sources • Conserve to extend availability of supply • Prevent formation of new small water systems • Remediate or reactivate threatened sources • Identify and protect new water sources • Economic feasibility of source development

Source: Issues were developed during 1995/96 work sessions of the Water Supply Policy Advisory Committee.

SUPPLY MANAGEMENT POLICIES AND STRATEGIES

These water supply policies address the reality of drinking water as a sustainable resource that is essential to life and sensitive to degradation. The adoption of broadly conceived supply management approaches will only be effective when they emphasize resource protection strategies, the efficient utilization of resources, and evaluate opportunities for new source development. Policies are listed along with strategies that identify on-going activities or practices and are indicated with a check box . New strategic recommendations, identified with an arrow , provide direction for augmenting or amending laws, regulatory actions, and offer guidance for other state and local initiatives.

RESOURCE PROTECTION AND SUPPLY

IT IS A POLICY OF THE STATE THAT:

S-1 Water systems shall strive to provide water that is of the highest quality practical. However, where feasible and appropriate, water shall be matched to the quality necessary for that purpose. (Reuse of water is encouraged where feasible and appropriate).

STRATEGIES

Plan land development to protect surface watersheds and groundwater recharge areas.

Restrict access to land owned or managed by water suppliers.

Maintain mechanisms to administer and finance watershed protection land acquisition programs.

Encourage the use of degraded supplies for non-potable purposes.

Evaluate situations that allow use of lesser quality water for less demanding uses.

Minimize adverse impacts to drinking water supplies by controlling non-point source pollution.

Enact effective measures (ordinances, development standards, legislative mandates, etc.) to protect water supplies.

Involve water system operators/managers in land use decisions in the watershed.

Enforce existing regulations which prohibit, ban, or limit activities that pose a threat to water quality.

Implement major users technical assistance programs (MUTAP).

Directly involve water system operators and managers in land use decisions in the watershed.

Identify generic industrial/commercial alternatives for non-potable water use.

Adopt cross-connection controls to safeguard drinking water from low-quality process water.

S-2 Effective watershed management and aquifer protection initiatives shall be implemented to prevent degradation and improve the quality of existing and potential

water supply sources. (Measures are intended to protect water quality by managing watershed lands owned by public water systems and land in private ownership.)

STRATEGIES

Enforce groundwater protection ordinances and underground discharge permitting (UST, LUST and UIC).

Plan land development to protect surface watersheds and groundwater recharge areas.

Maintain mechanisms to administer and finance watershed protection land acquisition programs.

Continue to update and implement Water Quality Protection Plans.

Restrict access to land owned or managed by water suppliers.

Continue to identify priority parcels for possible acquisition.

Maintain drinking water supplies to ensure safe yields.

Encourage municipalities to adopt the Rhode Island Model Erosion and Sedimentation Control Ordinance.

Minimize adverse impacts to drinking water supplies by enforcing the appropriate storage, application, and containment of road salt and other de-icing materials.

Implement site specific plans that integrate solutions for nonpoint sources of pollution (i.e., agricultural users).

Minimize water quality degradation with proper operation and maintenance of roads and bridges.

Amend municipal zoning ordinances, subdivision regulations and other land use regulations to 1) restrict hazardous uses within drinking water watersheds, 2) minimize point and non-point runoff into drinking water supplies and their tributaries, 3) maximize distance between development and drinking water supplies and their tributaries, 4) minimize development density and impervious surfaces within watersheds.

Enforce existing regulations which prohibit, ban, or limit activities that pose a threat to water quality.

Adopt wastewater management ordinances or plans to protect water quality in unsewered drinking water watersheds.

Increase compliance with legislation adopted to codify standing of water systems and encourage comment on proposed development within 2000 feet of watershed boundaries.

Enact effective measures (ordinances, development standards, legislative mandates, etc.) to protect water supplies.

Identify and protect potential new supply sources.

Examine land uses or activities that would benefit from some degree of control relative to their impact on water quality.

Directly involve water system operators and managers in land use decisions in the watershed.

S-3 Existing sources of supply shall not be abandoned as long as their water quality remains acceptable for intended uses and feasible for future reactivation. (Feasibility includes consideration of quality of the source, safe yield, cost/effectiveness analysis, and other statutory and non-financial constraints.) Water suppliers shall not

unreasonably be prevented from demonstrating that abandonment is in the best interest of the system.

STRATEGIES

Continue to accept water system managers judgment and privilege to evaluate the feasibility of and utilize a new water source.

Comply with Department of Health regulations for approval of new sources.

Re-evaluate feasibility of abandoned sources for emergency or high-volume commercial or industrial use.

Integrate existing supply sources with viable portions of the delivery system as a requirement of infrastructure development.

S-4 Public access and recreational use of surface water reservoirs shall be prohibited, and involved parties shall strive to eliminate existing uses in a fair and equitable manner.

STRATEGIES

Discourage reservoir and watershed access with signage and physical barriers, where appropriate.

Enforce restrictive covenants within watersheds.

Encourage elimination of physical human contact with drinking water supply sources.

Eliminate existing state supported recreational activity from drinking water reservoirs.

S-5 Adequacy of supplies shall be monitored on an on-going basis.

STRATEGIES

Continue to report and track availability and volume of water supplies.

Establish triggers for implementing voluntary and involuntary water conservation measures.

Monitor precipitation levels.

Maintain drinking water supplies to ensure safe yields.

Continue to investigate potential new water sources.

Continue to advance water quality protection by land acquisition and other methods.

Conduct 5 year analyses and 20-year strategies to plan for adequate future drinking water supplies and evaluate short and long term needs.

Consider availability of water supply as a preliminary condition of approval in proposed land use decisions and economic development proposals.

Utilize the best available information for build-out analyses and projections.

Manage water withdrawals in sole source aquifers or otherwise critically constrained water sources.

Standardize the collection and reporting of water availability.

S-6 Where feasible, water suppliers shall develop and enhance system redundancy (back-up capability) and expand interconnections for emergency response.

STRATEGIES

Prepare water management plans with triggers for critical low-water periods and emergency conditions.

Maintain system interconnections with routine inspection of structural components.

Maintain updated memorandums and/or agreements with adjacent communities for routine or emergency supplies.

Guide resource management and infrastructure development activities of public water systems through incentives, conditional financial assistance programs, and normal review procedures.

S-7 The state shall strive to coordinate interstate and intrastate agreements that support mutual water supply and watershed protection interests.

STRATEGIES

Charge existing agencies with coordination and oversight of developing mutual interests and agreements.

Work with state officials to coordinate interstate activities and support water system initiatives.

Quantify available water from interstate water supply sources.

Work with the highest levels of government to increase awareness of this issue.

COMPREHENSIVE PLANNING FOR WATER SUPPLY

IT IS A POLICY OF THE STATE THAT:

S-8 Land use regulations shall support water quality protection for public and private supply sources including individual wells.

STRATEGIES

Locate land uses with known detriment to water quality outside of watersheds, groundwater recharge areas, and wellhead protection areas.

Review and adopt zoning regulations as a mechanism to mitigate adverse water quality impacts.

Utilize creative growth management tools to protect the quality of individual, small, and community wells.

Promote watershed protection using conservation easements and acquisition of land development rights.

Increase compliance with legislation adopted to codify standing of water systems and encourage comment on proposed development within 2000 feet of watershed boundaries.

Minimize adverse impacts to drinking water supplies by enforcing the appropriate storage, application, and containment of road salt and other de-icing materials.

Implement site specific plans that integrate solutions for nonpoint sources of pollution (i.e., agricultural users).

Follow best management practices for all construction activities in the watershed.

Adopt wastewater management ordinances or plans to protect water quality in unsewered drinking water watersheds.

Encourage water supplier participation in the local land development review process.

Adopt education campaigns to promote maintenance and pumping of individual sewage disposal systems, especially in drinking water watersheds.

S-9 Municipalities shall balance the use of land and water resources in cooperation with local water supplier(s) serving their respective jurisdictions by:

- **balancing new development with available water supply;**
- **encouraging development that utilizes the existing infrastructure;**
- **considering cumulative impacts of development within watersheds and recharge areas;**
- **considering safe yield and capacity of the water supply and delivery system within community comprehensive plans;**
- **discouraging the formation of new small water systems;**
- **efficiently utilizing existing supply sources;**
- **protecting water quality through local land use and zoning;**
- **or other appropriate means and methods.**

STRATEGIES

Design zoning, comprehensive plans, and land development ordinances to protect surface watersheds and groundwater recharge areas.

Adopt wellhead protection programs and wastewater management districts where appropriate.

Enforce existing regulations prohibiting, banning, or limiting activities that pose a threat to water quality.

Consider availability and capacity of existing infrastructure in revised zoning regulations.

Enforce plumbing code standards relating to water conservation.

Follow best management practices for all construction activities in the watershed.

Enact preventative measures (ordinances, development standards, legislative mandates, etc.) to protect water supplies.

Improve metering as a method of evaluating use efficiencies.

Directly involve water system operators/managers in land use decisions in the watershed.

Investigate comprehensive regional approaches to groundwater protection.

Institute local disincentives to control sprawl development.

Improve ability to guide development to areas having adequate water.

Evaluate the technical and financial capacity of new small water systems.

Increase awareness of water quality protection through public education initiatives.

Implement conservation strategies before accessing new supply sources.

Address water as a utility and a resource within comprehensive plans identifying areas to be served, and any areas not scheduled to be served by public water, based on types and intensities of land use, and economic and environmental factors.

Incorporate policy recommendations in the services and facilities element of community comprehensive plans.

Consider availability of water supply as a preliminary condition of approval in proposed land use decisions and economic development proposals.

Incorporate demand management strategies into the development review process (e.g., limit lawn area, efficient balancing of water use).

S-10 Municipalities shall coordinate with appropriate state and local authorities and work toward the elimination of existing non-viable water systems.

STRATEGIES

Identify point and nonpoint threats to water quality.

Enforce groundwater protection ordinances and underground discharge permitting (UST, LUST and UIC).

Adopt local wellhead protection programs and wastewater management districts, as appropriate.

Continue licensing program for bottled water suppliers.

Identify priority locations for providing preventative maintenance and technical assistance to small systems.

Identify practical options for regionalization of small systems.

Evaluate alternative design systems for approval in areas with constraints.

Capitalize grant or loan programs to provide engineering and construction of new ISDS.

Develop programs to provide bottled water to homeowners or small systems whose wells have been contaminated by anthropogenic sources.

Coordinate local and state efforts to eliminate non-viable systems.

Explore ways that state and local authorities and agencies may work together to consolidate information gathering.

NEW SOURCE DEVELOPMENT

IT IS A POLICY OF THE STATE THAT:

S-11 Adequate future water supplies shall be provided through on-going short and long term planning, identification of need, evaluation of potential new water supplies, protection by advance acquisition, and other methods.

STRATEGIES

Evaluate and rank test wells for new source potential.

Identify and protect potential productive, high-quality water supplies.

Continue to manage interim use of land purchased for future water supply.

Protect potential new water supply by purchase or advance acquisition.

Require monitoring, data collection and analysis as a component of comprehensive water management planning.

Data shall be gathered and used in a standardized manner to evaluate alternatives and conduct water use efficiency analysis before supporting new supplies.

Develop a technically sound and universally applied calculation for safe yield.

Facilitate cooperative efforts of state, municipal, and local agencies to implement short and long term strategies.

Adopt land use controls to protect quality of potential groundwater supplies.

Actively manage high-quality (GAA) rated groundwater aquifers as potential drinking water supply sources.

Expand monitoring programs to aquifers with potential for future use.

Project water supply needs as part of water supply management planning and within comprehensive plans.

Prioritize potential new water supplies based on their adequacy, cost, and location relevant to development patterns and evaluation of areas suitable for future growth.

Estimate withdrawal levels that will not affect surrounding water resources (wetlands, water tables, stream flows).

Establish withdrawal controls/strategy to protect availability of supply.

Availability of water supply shall be a preliminary condition of approval in proposed land use decisions and economic development proposals.

Improve water use and contingency analysis.

Develop uniform and standard criteria for determining the recharge rate of groundwater aquifers.

Maintain a level of less than 15 percent non-account water in public systems.

Maintain a standardized database to establish water quality trends and conduct comparative evaluations.

Integrate existing and planned supply sources with viable portions infrastructure / delivery system as a requirement of new source approval.

S-12 As a condition of approving new community sources, the following criteria shall be followed:

- **the need for the new source based on factors such as adequacy of supply, quality of existing sources, redundancy, etc.;**
- **potential expansion of existing sources;**
- **permanent water savings resulting from demand management initiatives.**

STRATEGIES

Enforce plumbing code standards relating to water conservation.

Evaluate and rank test wells for new source potential.

Identify potential productive, high-quality water supply sources.

Improve metering as a method of evaluating use efficiencies.

Encourage water supplier participation in the local land development review process.

Identify generic industrial/commercial alternatives for non-potable water use.

Integrate existing and planned supply sources with viable portions of delivery system as a requirement of new source approval (e.g., use existing infrastructure, increase efficiency, loops)

Limit development to those areas having adequate water, or that will have adequate water as proposed in the local comprehensive plan.

Increase awareness of water conservation through public education initiatives.

Project water supply needs.

Prioritize potential new water supplies based on their adequacy, cost, and location relevant to development patterns and evaluation of areas suitable for future growth.

Implement conservation strategies before accessing new supplies.

Establish withdrawal strategies to protect availability of supply.

Develop guidelines to improve the usable supply and maximize efficiencies of drinking water.

Demonstrate need and ability to manage before approving new sources (e.g., establish lack of adequate supply or redundancy; ability to deliver or manage a safe supply).

Part 721-5

DEMAND MANAGEMENT

Introduction to the Issues

Demand management can be defined simply as any conscious effort to modify water use. Accepting demand management as a concept, however, is often complicated by different interpretations of how to determine actual demand and the effect of various factors on withdrawal rates of different water systems. Demand management is not synonymous with water restrictions, changes in lifestyle, and a reduced standard of living; demand management is efficient utilization of the available supply. Implementation of demand management strategies should result in properly designed programs that assure supplies at prices that reflect the true value and cost of providing that resource, combined with the ability to reduce wasteful use.

The 1988 *Water Supply Policies* itemized four demand management policies. This updated plan corroborates and considerably expands on what was established in the 1988 policy plan. As can be seen in Table 721-5 (1), the basic issues and concerns remain familiar. What has changed over the past decade is that new demands placed on consumers and suppliers have encouraged more activities that should increase the long-term efficiencies of water utilization. **The stated goal of demand management is to modify water consumption and promote supplier and user efficiencies through public awareness and demand management initiatives.**

Efficient water use benefits both consumers and suppliers, but it is not the panacea for maintaining available supplies. Potential drawbacks should also be recognized, and mitigating drawbacks early on can be successful with planning that anticipates problems and addresses concerns in a timely manner. It is well known that benefits derived from water conservation initiatives may extend the life of existing supply sources, conserve energy, reduce costs, lower the frequency of emergency incidents, and reduce environmental impacts of supply development. On the other hand, potential problems can result from increased efficiency. These may include expansion of service from a misleading concept of "additional supply", an overall reduction in revenue, increased drought vulnerability during critical low water periods, or the delay and increased expense of necessary water development projects if conservation efforts prove inadequate.

The term water conservation encompasses many different methods, procedures, and devices designed to promote the efficient use of water and eliminate waste. The U.S. Water Resources Council defines water conservation as "activities designed to reduce the demand for water, improve efficiency in use and reduce losses and waste of water, and improve land management practices to conserve water."[35] The Rhode Island Water Supply Management Regulations simply define conservation as "methods, procedures, and devices designed to promote efficient use of water and eliminate waste."

[35] William O. Maddaus, Water Conservation, American Water Works Association, (1987).

As we approach full utilization of existing supply, water systems will face decisions about whether to develop new sources and capacity. Supply development will undoubtedly require increasingly large capital outlays and meet health and environmental standards, but it may provide greater security by making more water available. Reduced water use through more efficient utilization, however, could postpone and, in some cases, obviate the need for expansion.

In economic terms, demand is the desire for a product together with the ability to pay for it, or the amount of a commodity or service that people are ready and able to buy at a certain price. As is the case with other subsidized industries, utilities, or programs, the price of drinking water does not reflect the actual costs of supplying the end product. Prices are artificially set as water systems are supported by other entities instead of being run as independent enterprise systems or for-profit businesses.

A water utility creates income by charging fees for water used. How the utility sets those fees influences the utility income, patterns of local water use, and public perception of the utility's fairness. Historically, water rates have been set to reflect the average cost of water; that is, the total cost divided among users without regard for how users influence the costs. Water has traditionally been an inexpensive commodity, and rates are based on the cost of obtaining, treating, and transporting the water. Often, water systems have benefited from past investments and, because of their age, have not required a large amount of capital input, setting a precedent for artificially low prices.

Evidence suggests that pricing is one of the most significant factors affecting water use, as well as one of the more straightforward ways of achieving efficient utilization. The average cost of water, compared to other goods and services, is extremely low. Economists have made the argument that water rates should reflect not the average cost but the cost of providing the next unit of water obtained by the utility, the marginal cost. If rates were based on marginal costs, they would increase to reflect the availability and delivery costs of new water. Arguments raised against such an approach, however, contend that it requires the price setter to predict the cost of the next unit of supply.[36]

Pricing has been used as a water conservation practice throughout the country; however, a few caveats should be kept in mind regarding its potential for reducing consumer demand. Although pricing is a very complex issue that is utility-and community-specific, price increases will not significantly affect residential water use until water bills account for a significant portion of the family budget. Reportedly, the response to price increases has diminished as consumers become more accustomed to paying more.[37] Research shows that, while significant cost savings can be achieved through conservation, and industrial users will make cost-beneficial modifications, pricing has been most effective in reducing residential peak use and average use of commercial and industrial users.[38]

---

[36] Westerly Water Department, Water Supply Management Plan, vol.II, 1994.

[37] New Mexico Solar Energy Institute, Saving Water - A Handbook for Community Water Conservation, nd.

[38] Ibid.

Water conservation is beneficial to both consumers and water suppliers, saving water, conserving energy, and increasing system efficiencies related to treatment and operations. Experience indicates, however, that top-down conservation strategies no longer work as they might have 20 years ago. But reliance on bottom-up approaches alone will not work either.[39] Public awareness of water resource issues and its importance to everyday life is minimal. Emphasis must be on local action, public education, and management combined with partnerships and incentives of state and federal programs.

Considerable accomplishments in the water conservation arena have been made over the past several years, especially in technological advances and increased understanding of the importance of conservation. Attitudes and policies are changing as population growth, land development, degradation of ground and surface water quality, and competition for limited supplies necessitates a new direction. This is not a local occurrence, but part of a global awareness of modifications that must be made to maintain the sustainability of the population and planet.

Water conservation is no longer endorsed just for parts of drought-stricken California. It is now accepted in relatively water-rich states of the Northeast, including Rhode Island. The implementation of conservation initiatives is a proactive, preventative approach to meet future water supply needs. Whether the strategy is retrofitting toilets and shower heads, alternating outdoor water use, or installing drip irrigation, the assumption is that the final count will be measured in our favor when everyone is contributing to the whole.

The concept that the following demand management policies convey is that long-term water conservation measures may be initiated and waste reduced or eliminated through demand and water supply management practices implemented at the state, local, and individual level. In this way water resources can be conserved with technologies and programs designed to promote efficient use and eliminate waste prior to tapping new supply sources. By accepting the function of conservation as a long-term mechanism to reduce demand, it is likely that we may reduce or delay the need to develop additional supplies.

[39] Coyle, Kevin, "Watershed Conservation in America: The Swift River Principles", River Voices, Volume 6, Number 3, (Fall/Winter 1995): 4.

TABLE 721-5 (1)

DEMAND MANAGEMENT ISSUES

AREAS OF STRATEGIC CONCERN	ISSUES
Water Conservation and Demand Efficiency	• Plumbing code requirements • Retrofit of plumbing fixtures • Local conservation programs and incentives • Metering • Use restrictions • Leak control • Industrial / commercial evaporative loss • Recycling, reuse, and waste elimination • Pricing • Irrigation • Seasonal use

Source: Issues were developed during 1995/96 work sessions of the Water Supply Policy Advisory Committee.

DEMAND MANAGEMENT POLICIES AND STRATEGIES

Demand management is not a substitute for planning to meet present and future needs. It is a technique to be used in conjunction with short and long range assessments that determine need. The demand management policies present choices that should be evaluated on an individual water system basis and at the municipal level. Independent planning and implementation of demand management programs must be done because of variations in public water system characteristics. Policies are listed along with strategies that identify on-going activities or practices are indicated with a check box . New strategic recommendations, identified with an arrow , provide direction for augmenting or amending laws, regulatory actions, and local initiatives.

WATER CONSERVATION AND DEMAND EFFICIENCY

IT IS A POLICY OF THE STATE THAT:

D-1 Demand management, including the establishment of attainable and targeted water use reduction objectives, shall be an integral part of water resource management.

STRATEGIES

Encourage supplier and user efficiencies through public relations, public education campaigns.

Conduct water audits for major users.

Implement a residential retrofit program (RRP) to plumbing code standards.

Reduce water loss through implementation of leak detection and repair programs.

Establish a meter replacement program.

Maintain efficiencies of treatment plant operations.

Implement outdoor watering strategies that minimize evaporation.

Develop water conservation standards for user groups (e.g., agricultural, residential, sole source aquifer public water users).

Evaluate efficiencies of non-potable water usage.

Implement major users technical assistance programs (MUTAP).

Control evaporative losses in process use.

Improve water use and contingency analysis.

Initiate water conservation measures that have proven cost efficiencies.

Execute a program for 100 percent metering.

Strive to achieve and maintain less than 15 percent non-account water.

Assist major commercial and industrial users in mitigation of evaporative losses.

Eliminate once-through cooling in process water use.

Promote proper maintenance and management of lawns, golf courses, and other landscaped areas.

D-2 Water suppliers shall implement conservation programs to encourage their customers to use water efficiently.

STRATEGIES

Make available low / no-cost water saving devices.
Develop triggers for voluntary and mandatory use restrictions.
Adopt water use priorities for different clients.
Institute time-of-day use restrictions.
Issue bans on outdoor water use.
Encourage retrofitting for residential and commercial users.

Ration.
lnitiate moratoriums on service connections when appropriate.
Implement reuse/recycling systems.
Adopt peak or seasonal pricing.
Control evaporative losses in process use.
Promote proper maintenance and management of lawns, golf courses, and other landscaped areas.
Use landscape material and methods that are drought resistant.

D-3 Water suppliers shall strive to reduce peak demands.

STRATEGIES

Restrict certain outdoor water uses.
Institute time-of-day use restrictions.
Encourage retrofitting for residential and commercial users.
Maintain peak flow standard to include projected fire flows.

Adopt differential rate structures.
Implement peak or seasonal pricing.
Implement reuse/recycling systems.
Manage and minimize the difference between peak and average demand utilizing the existing infrastructure.
Evaluate cost-efficiency of proposed public works projects or capital investment to achieve peak demand reductions.

D-4 Commercial and industrial consumers proposing new uses, or major changes of use, shall utilize appropriate technical standards for consumption projections and shall utilize cost-effective, state-of-the-art equipment for controlling water use.

STRATEGIES

Implement major user technical assistance programs (MUTAP).

Enforce state building code requirements for new construction of commercial and industrial uses.

Amend the state building code to require fixture retrofitting for changes of use to commercial and industrial development.

Adopt per capita technical standards for fixture unit calculations and to develop water consumption estimates.

Implement conservation measures particularly when changing a vacancy to a reuse or allowing more intensive use of an existing use.

Review water consumption as part of the building permit process.

Control evaporative losses in process use.

Recommend water reductions during early review stages (e.g., state review).

Involve water suppliers in the decisionmaking process for new major users.

Assist major commercial and industrial users in mitigation of evaporative losses.

Utilize Standard Industrial Classification (SIC) codes to correlate comparisons of water use.

Substantiate consumption volumes based on average national standards for new development proposals.

PART 721-6

PLANNING AND ADMINISTRATIVE MANAGEMENT

Introduction to Issues

Many issues discussed in this section have counterparts within other policy categories. In a generic sense, the issues here are classified as challenges for planning and administrative functions, technical water-use data management and financial management, and public education. **The goal that is the foundation for the planning and administrative management policies is to ensure public health, safety and welfare, optimize water system efficiency, educate the public, and address planning and administrative needs to ensure availability of supply.**

Generally, aspects of water supply related to public health and maintaining availability of supply fall under the guidance and standards of the federal Safe Drinking Water Act (SDWA). The intent of the SDWA is for each state to accept primary responsibility (primacy) for the operation of drinking water programs within the state. In return, the state receives a federal grant to supplement state funds to operate the program. The RI DOH has primacy for enforcing these standards in Rhode Island. The standards are enforceable for all public water systems, and the DOH requires stringent testing and monitoring to assess compliance with the regulations and to ensure proper water system operation and protection of public health.

All surface waters, as well as groundwater that is under the direct influence of surface water, are at risk of contamination by bacteria and other microorganisms. Federal regulations require all surface water systems to use a treatment technique that ensures adequate removal or inactivation of harmful organisms. The parameters tested can be categorized as inorganics, volatile organic compounds (VOCs), semi-volatile organic compounds (SVOCs), metals, pesticides, and herbicides. Typically, water testing for bacteria is carried out on a monthly basis; a more comprehensive analysis of water quality for inorganic and organic constituents and radiological data is generally conducted once a year.[40]

There is more to the problem, however, than monitoring, testing, and maintaining SDWA compliance, especially for small water systems. Historically, most small water systems were established in an environment of abundant, high-quality water supplies when treatment requirements were minimal. All that was needed were a well, pump, and tank; costs were low, deterioration was slow, and maintenance was not an issue. In this low-cost environment, small water systems were doing all that was required and remained seemingly viable.

Today's environment is markedly different. No longer are supplies considered unlimited. Treatment requirements are broader and tougher for conventional contaminants, and the need for a higher level of operation and maintenance of small water systems is evident. These new challenges require long-term, comprehensive initiatives that include early evaluations of system

[40] EPA, Drinking Water Handbook.

viability. Otherwise, as small systems sink more and more money into upgrades and compliance expenditures, there will be a greater reluctance to reorganize, even if it is the most rational alternative.

Generally, viability programs are designed to assess a water system's ability to meet current and prospective regulatory requirements consistently and to determine the best solution for bringing nonviable systems into compliance. The most comprehensive approach used by some states involves conducting a viability assessment and developing a strategy for restructuring nonviable systems through management or ownership changes (e.g., consolidation with larger water systems) so that systems have the resources to meet SDWA requirements. Where consolidation of nonviable systems is not feasible, programs to improve compliance with drinking water requirements may be the best options. Without the assessments, however, opportunities for cooperation and consolidation may be lost.

It is increasingly recognized that the fundamental issue lies with the sheer volume of small water systems that will lack the capacity to remain in compliance with drinking water regulations over the long term. Nationally, over 85 percent of the approximate 200,000 community water systems serve fewer than 3,300 persons, classifying them as "small systems." Nearly two-thirds serve fewer than 500 persons; these are in the "very small system" classification. Combined, the small and very small systems represent close to 90 percent of all violations and 80 percent of all significant noncompliers under the SDWA regulations currently in force (1986 amended).[41]

Health Department records show that trends in Rhode Island are similar to the national situation. The majority of persistent violations of bacteriological standards and reporting requirements are attributable to the small systems. Compared with other types of violations (for monitoring, lead/copper rules, or other treatment technology violations), Rhode Island's very small system violations of the maximum contaminant level (MCL) for bacteria have been persistently the highest starting in 1994, however, the DOH has emphasized those small systems and reduced the number of bacteriological violations in 1995 by 45 percent.[42]

Another administrative issue is that both employees and managers of public water systems are realizing the need for proper employee training. Most states now require that community public systems be under the direction of a certified operator.[43] Increasing emphasis on mandatory certification is viewed as a means to ensure that the complex responsibilities of water system operation are directed by competent persons.

A prominent planning issue is competition for water by multiple users, including domestic, industrial, commercial, recreational, and agricultural users. The competition makes it all the more necessary to determine how much water is available in river basins. As a new era approaches, farms and businesses, residents and industries, flora and fauna may be forced to compete for a limited supply of water. It is critical that we remain mindful of the varied interests

41 Environmental Protection Agency, Viability Primer for State Drinking Water Programs, Draft, nd.

42 RI Department of Health, Annual Report 1995, DRAFT.

43 EPA, Drinking Water Handbook: 39.

competing for the use of water; however, it is just as essential to realize that the quality and quantity of our drinking water are the essence of our existence as a human race and a developed industrial society.

Because competing demands on water supplies are expected to continue in Rhode Island, adequate planning and management of water resources will be required to ensure that water supply shortages and unreasonably low streamflows do not become a problem in the future.[44] There is evidence of shortages in the increasing frequency of mandatory and voluntary water bans, lower reservoir volumes, and decreased flows in streams and tributaries during critical low-water periods. In practice, consumers can generally be persuaded to curtail water use during times of drought, and implementing drought or emergency management programs could increase safe yield perhaps by several million gallons per day in a major system. But the key to success is cooperation; it is essential not only to avert conflict but to protect the hydrological connections that underpin a functional system.

The issue raises the question of priorities -- how tolerant are we to reducing volumes for specific uses? Are we willing to forgo summer car washing and lawn watering on a regular basis? Are we ready to commit a guaranteed volumetric flow to farmers? Is it important to maintain flow rates for fish, aquatic habitat, and recreation along riverine corridors? Are we able to support economic growth and maintain a reliable supply of drinking water for our citizens? These are all value judgments that must be decided by a process that appropriately assigns responsibility for decision-making of this magnitude. Rhode Island legislation assigns responsibility for water management to several agencies. It may soon be time to determine which uses are more beneficial and should receive priority status.

The state's fragmented approach toward water resource management further complicates the resolution of such situations. There is no state agency with clear authority to address this issue. Decisions must be made through a process that includes representation of the multiple users and interests. A number of other states have enacted legislation to require the collection of withdrawal data, and the registration or permitting of withdrawals or use in excess of a specified rate or established safe yield volume to support water resources management.[45]

This situation presents an issue that will not simply be resolved with top-down management and regulation. Although government may assist by developing a set of flexible tools to respond to individual water basin situations, the best success may result from offering incentives that empower local people, with non-regulatory guidance, to deal effectively with their own situations. A state role in coordinating activities has the potential to increase local partnerships, placing greater emphasis on incentives that encourage desirable results at all levels, without the expansion of regulatory programs.[46] Failure to resolve conflicts at the state level can either engender similar avoidance at a local level, or promote a diversity of locally based

---

[44] John D. Kliever, Low-Flow Characteristics of Selected Streams in Northern Rhode Island, U.S. Geological Survey, Report 95-4299, (Providence, [1996]), p.1.

[45] Ibid., 20.

[46] Coyle, "Watershed Conservation in America,": 4.

responses that address the unique and extraordinary aspects of single sources, basins, or emergency conditions.

Effective water resource management is contingent upon the data provided by a comprehensive water use data program. Benefits of a comprehensive program would include improving the basis for decisionmaking for water supply development and conservation measures, identifying areas of concentrated withdrawals, assessing the impact that new withdrawals or required minimum flows could have in a given area, and minimizing the need for sporadic but costly inventories of current water use.[47] A comprehensive database could be used by all agencies to support planning and reporting functions. This, in turn, could improve coordination among the different agencies and levels of government involved in water resource management -- a stated objective of the 1988 policy plan.

Critical dry periods and localized drought conditions over the past several years have heightened awareness of water withdrawals from streams and the lack of state policy during low-flow situations. For example, in two out of the past three years, the DEM has issued letters to irrigators in the Wood-Pawcatuck watershed requesting water conservation and then to "cease all nonessential use" of water. Many agricultural producers already feel they are irrigating only when essential, and they question the environmental impacts associated with their withdrawals.[48] More data and research are needed to determine impacts to aquatic ecosystems resulting from water withdrawals during low flows. Flow stages and base flow requirements need to be more clearly refined for parameters that reflect local conditions.

Data now supports the realization that withdrawal of fresh surface water in some parts of the state is approaching the operational capacities of developed water supplies.[49] Solutions to alleviate this problem may include development of new sources, more efficient use of existing supply, or a combination of both ideas. A thorough evaluation of alternatives requires accurate and comparable water use data, and the development and implementation of a well-planned, comprehensive, and continuous water use data program. To be efficient and effective, a program must be routine and periodic as the collection, analysis, and dissemination of water use data is costly and time consuming.

The DOH, DEM, and WRB independently collect and process data to fulfill their own information requirements; accordingly, accuracy, frequency of reporting, and sampling techniques differ among the agencies.[50] The WRB intermittently collects, but does not computer-process, information on the withdrawal and distribution of water by 33 of the 89 community public water supply systems. The DOH collects and processes data for public drinking water systems to ensure compliance with water quality standards, through their testing requirements and sanitary surveys completed every three years. The DEM periodically collects

47 Horn and Craft, Water-Use Data Program.

48 Pawcatuck River Hydrologic Unit Area, Annual Report F/Y 1995.

49 RIDOA, Water Supply Policies.

50 Horn and Craft, Water-Use Data Program: 16.

return flow data as part of the Rhode Island Pollutant Discharge Elimination System (RIPDES) permitting, which sets limits for and monitors pollutants discharged to surface waters.[51]

A centrally managed data system could consolidate these tasks and streamline planning requirements. Additionally, the real power of computerizing the information data base is that it eases the task of sorting, updating, summarizing, or copying an entire file; and it offers comparative functions to be performed by relational (field/record) data base programs. It also facilitates progression to more complex applications that can link statistical analyses and digital mapping to produce geographic representations of water resources and conditions.

Water suppliers reserve primary responsibility for water supply management at a local level but recognize that state laws, policies, and programs will strongly influence local initiatives. This is true for aspects of management that focus on preventative maintenance, structural rehabilitation, and financial management, too. As insurance for maintaining system reliability, proper maintenance of production and distribution equipment is essential. Infrastructure planning, now required by state law for major systems, is intended to maximize efficiency of use and achieve better protection for public health.

It should be recognized that the price of water must reflect the total cost, including the capital costs of the facilities and distribution systems, protection of water quality, operations, maintenance and replacement of infrastructure, and depreciation of capital assets. Utilities in need of infrastructure upgrades and capital improvements are finding it essential to meet new federal requirements for health and safety; these costs should be considered in establishing pricing and rate structures. This is not a stand-alone concept; it must be combined with other strategies that emphasize local action and maintenance of technical and operational viability.

[51] Ibid.

TABLE 721-6 (1)

PLANNING AND ADMINISTRATIVE MANAGEMENT ISSUES

AREAS OF STRATEGIC CONCERN	ISSUES
Planning and Administration	• Compliance with Safe Drinking Water Act • Costs of federal and state mandates • Infrastructure needs of small systems • Redundancy • Regionalization of small systems • Prevention of new small system development • High-priority among competing uses • Multiple use conflicts • Certification requirements • Professional development • Cooperation/coordination among state agencies • Authority to restructure failing water systems • Leak detection and repair • Maintenance and infrastructure replacement • Metering • Cross-connection control • Backflow prevention • Updated treatment technology
Technical Data and Financial Mgt	• Monitoring and trend analysis • Availability of current information • Pricing and conservation incentives • Standardized reporting data • Record keeping and reporting status on water use, infrastructure, non-account water, and financial data • Coordination and consolidation of data • Centralized water supply information system • Financial viability, technical expertise, and management capability of small systems • Support for water-saving investments • Technical and financial assistance programs • Projecting future demand • Increasing block rate structure • Appropriate fees and rates for cost of service
Public Education	• Training for water supply employees • Information and education programs • Public education on consumer initiatives for source protection and conservation • Education on the costs of source protection

Source: Issues were developed during 1995/96 work sessions of the Water Supply Policy Advisory Committee.

PLANNING AND ADMINISTRATIVE POLICIES AND STRATEGIES

Water supply planning must be conducted with a knowledge of where we are, where we want to go, and how to get there. Planning must also accommodate the structure of agencies and decentralized management that typifies this discipline, and work toward establishing mechanisms and processes to deal with complex water issues of the coming decades. The strategies that identify on-going activities or practices initiated to implement the planning and administrative policies are indicated with a check box . New strategic recommendations, identified with an arrow , provide direction for augmenting or amending laws, regulatory actions, and local initiatives.

PLANNING AND ADMINISTRATION

IT IS A POLICY OF THE STATE THAT:

P-1 Water for drinking and the sustenance of life shall be the priority use while striving to protect other uses and considering public health, safety, and the overall economic well-being of the state.

STRATEGIES

Maintain high resource protection standards for existing drinking water sources.

Acquire parcels over GAA quality aquifers for conservation.

Maintain and enforce state standards contained in water quality regulations.

Maintain drinking water supplies to ensure safe yields.

Prioritize the multiple uses and users in competition for water supplies (e.g., commercial, industrial, residential, agricultural, and recreational uses).

Establish a process to register minimum flows.

Develop and institute a formal process for allocating water supply resources among competitive uses.

Balance present and future water supply needs to insure the long term sustainability of resources.

Investigate the economic and environmental impacts of allocative decisions.

Examine public health implications regarding the future quality and quantity of water supplies.

P-2 Water system facilities and infrastructure shall be maintained and improved to:

- **protect public health, safety, and welfare;**
- **protect the investment of the rate payers and proprietors;**
- **ensure efficient use and quantity of water supplies.**

STRATEGIES

Maintain oversight of water system testing and monitoring compliance.
Conduct water audits.
Continue to implement comprehensive infrastructure planning.
Repair and/or replace meters to maintain accountability for system water.
Continue to implement leak detection, repair, and metering initiatives.
Encourage reporting of suspected system leakage.
Strive to account for as much water produced as possible.
Adopt standards for cross-connection control and back flow prevention.

Direct financial resources to support improvements to transmission and distribution of potable water.
Maintain a level of less than 15 percent non-account water.
Adopt appropriate control ordinances, conduct inspections, and educate customers on cross-connection prevention.

P-3 The Department of Health shall maintain primacy for and continue to enforce the requirements of the SDWA.

STRATEGIES

Continue Department of Health oversight of monitoring, testing programs, and compliance standards.

Ensure that new water systems demonstrate the capacity to comply with all drinking water regulations before granting approval.
Ensure that new water systems demonstrate financial and managerial capacity to sustain the water system before new source approval is granted.

P-4 Water systems shall implement cross-connection and backflow prevention programs.

STRATEGIES

Adopt standards for cross-connection control and back flow prevention.
Continue to implement comprehensive infrastructure planning.

Adopt appropriate control ordinances, conduct inspections, and educate customers on cross-connection prevention.

P-5 Non-viable systems shall be consolidated or restructured when public health is at risk, or when the public interest or greater economies of scale may be realized.

STRATEGIES

Promote regionalization and consolidation of small systems.

Develop and implement small system viability assessment programs.

Assist non-viable small systems to consolidate.

Utilize State Revolving Fund (SRF) as a funding source for technical assistance and to assist in restructuring small systems.

Promote and conduct small systems board training on the costs and benefits of regional management approaches.

P-6 Withdrawals from both surface and groundwater sources shall be managed based on improved data taking into consideration the safe yield of surface reservoirs and the recharge rate of groundwater aquifers.

STRATEGIES

Maintain stream flow data.

Estimate site-specific groundwater withdrawal levels that will not adversely affect surrounding wetlands, water courses, and water tables.

Determine reliable measures of comparative analysis among systems.

Establish a withdrawal strategy to protect availability of supply and guide allocative decisions.

Develop a formal process for allocating water resources using a basin-by-basin analysis among competitive uses that balances present and future needs and insures the long term sustainability of the resource base.

Prioritize the multiple uses and users in competition for water supplies (e.g., commercial, industrial, residential, agricultural, and recreational uses).

Designate a responsible entity, representing all affected parties, for making allocative decisions, and outline principles and procedures to be followed.

Establish a process to register minimum flows.

P-7 The professional development of water system employees shall be enhanced through educational and certification programs.

STRATEGIES

Continue to mandate specific continuing education units (CEU's) for keeping abreast of changing rules and technologies.

Encourage attendance at professional meetings.

Advance training and education of water system employees.

Provide opportunities for training seminars.

Enforce the standards established by the water supplier certification board.

Expand certification requirements and operator training.

P-8 Water suppliers shall strive to minimize non-account water.

STRATEGIES

Conduct water audits and leak detection and repair.

Encourage reporting of suspected system leakage.

Repair and/or replace meters to maintain accountability for system water.

Continue on-going dam maintenance programs.

Establish a goal of 15 percent non-account water.

P-9 The Statewide Planning Program shall periodically review progress toward implementation of the policies, with information provided by the Water Resources Board and others, as required. The progress report shall also include recommendations for legislation as necessary for implementation of water supply policies.

TECHNICAL DATA AND FINANCIAL MANAGEMENT

IT IS A POLICY OF THE STATE THAT:

P-10 Standardized methods for collection and reporting of data on water production, water use, and demand projections shall be established and used.

STRATEGIES

Continue water use data collection and reporting.

Continue to separate major demand components - industrial, commercial, and residential users -- for comparative evaluations.

Explore ways that state agencies may work together and consolidate information gathering.

Review existing planning requirements for water resource management and consolidate duplicative functions.

Ensure compatibility of databases with appropriate metadata standards.

Develop consistent methods of calculating demand for sound projections of water use.

Require data collection and reporting standards for use above a minimum rate.

Specify frequency of data recording intervals (monthly or annual).

Establish an acceptable reporting frequency.

Appoint a data manager responsible for centralized system management and design.

Maintain a standardized data base to establish water quality trends and conduct comparative evaluations.

Develop uniform and standard criteria for determining the recharge rate of groundwater aquifers.

Develop a technically sound and universally applied calculation for safe yield.

P-11 Public water systems shall have financial and operational independence to manage their resources effectively.

STRATEGIES

Create enterprise funds or regional authorities for water system management.

Finance the acquisition of land or conservation easements for protecting established wellhead protection areas from contamination.

Adopt enabling legislation to allow regional boards and authorities.

Provide support for infrastructure repair and replacement initiatives.

Utilize State Revolving Fund (SRF) monies to administer water protection programs, technical assistance, and to aid restructuring of small systems.

Develop standards for voluntary and incentive-based strategies for the long-term protection of water sources.

Provide small communities with technical assistance on protecting water supplies.

Form partnerships to take advantage of quantity purchasing, joint use of specialized equipment, use of shared certified operators, or other cost-saving procedures.

Offer incentives to prevent the formation of water systems that do not have the financial, technical, managerial capacity to meet SDWA requirements.

P-12 Measures shall be taken to ensure that water systems meet SDWA standards and maintain their technical, operational, and financial viability.

STRATEGIES

Conduct infrastructure reviews and provide planning assistance.

Implement requirements of the Safe Drinking Water Act.

Maintain oversight of monitoring and testing requirements.

Discourage the establishment of special water districts, fire districts, and small non-public systems.

Extend sanitary surveys to small systems.

Utilize the State Revolving Fund (SRF) for technical assistance and to aid restructuring of small systems.

Form partnerships to take advantage of quantity purchasing, joint use of specialized equipment, use of shared certified operators, or other cost-saving procedures.

Offer incentives to prevent the formation of water systems that do not have the financial, technical, managerial capacity to meet SDWA requirements.

Encourage no new non-viable small systems.

P-13 Develop an integrated database that shall include groundwater levels, precipitation, stream flow, and other data needed to determine safe yield and the recharge rates of surface supplies and groundwater aquifers to serve the needs of water system managers and the planning functions of the state.

STRATEGIES

Maintain data from surface and groundwater monitoring sites of the USGS and others.

Maintain USGS gauging stations for determining flow rates and other stream flow data.

Compile precipitation and stream flow data and make it available for public use.

Consolidate monitoring data utilizing appropriate metadata standards.

Investigate opportunities to manage water-use data with a relational database and make it available for public use in an interactive form on the internet.

Incorporate a geographically based mapping component into the database.

Expand monitoring functions and locations so as expand existing data and analyze new source potential.

P-14 Pricing structures shall reflect the total, just, and reasonable costs of the supply, operation, and protection of water systems, capital improvements, and replacement of infrastructure.

STRATEGIES

Structure pricing to reflect all system costs.
Establish hookup fees for new users.
Change fee structures to cover increased delivery costs.
Adopt water line extension fees.

Include the costs of capital development and infrastructure replacement in establishing water rates.
Replace average cost with marginal cost pricing.
Utilize good accounting practices to justify water rate adjustments and/or periodic reporting to demonstrate financial standing (accounting standards are essential to justify requests before PUC).
Provide price incentives for major users to install water reuse and recycling systems.
Utilize comparative financial analysis to evaluate supply or demand techniques.
Maintain separate accounting records for water systems.
Ensure adequate funds are available to meet obligations in addition to operating expenses.
Develop conditional finance assistance programs.

P-15 Technical information shall be made available to consumers to facilitate demand management and to guide the resource management activities of water systems.

STRATEGIES

Provide incentives for implementation of water conservation measures.
Develop public education campaigns to increase consumer awareness.
Familiarize consumers with the importance of resource protection strategies.
Carry-out on-going public education in schools and libraries.
Develop educational flyers for demand management and water conservation in water bills.
Continue to support public campaigns such as Drinking Water Week.

Initiate public relations campaigns to promote public awareness of critical issues that require customer participation.
Provide educational opportunities for water boards, PUC, and legislature.

P-16 Financial and other incentives may be used to promote the provision of safe drinking water, conservation, and the elimination of non-viable systems.

STRATEGIES

Promote training and education of water system employees.

Evaluate and fund water system infrastructure improvements.

Review rate restructuring as a means of providing safe drinking water.

Capitalize a funding source to match SRF funding for safe drinking water.

Provide commercial and industrial incentives for conservation such as sprinkler systems, recycling process water, etc.

Provide grants and loans for water treatment, consolidation, and infrastructure replacement as it is required.

Develop conditional finance assistance programs.

Develop other incentives as a means of providing safe drinking water.

P-17 State and local revenues and surcharges collected from drinking water supplies shall be restricted to their intended purpose.

STRATEGIES

Continue to utilize watershed protection program funds available for resource protection from the "penny per hundred" program.

Establish procedural guidelines to distribute SRF safe drinking water funds.

Subsidize SDWA portion of the CWFPA for loans through capitalization of a state aid program.

Provide grants and loans for treatment, consolidation, and infrastructure--as it is required.

Maintain water related surcharges in dedicated restricted receipt accounts.

P-18 The state shall support the state drinking water revolving loan fund and come up with matching funds.

STRATEGIES

Establish procedural guidelines to distribute SRF safe drinking water funds.

Subsidize SDWA portion of the CWPFA for loans through capitalization of a state aid program.

Capitalize a funding source to match SRF funding for safe drinking water.

PUBLIC EDUCATION

IT IS A POLICY OF THE STATE THAT:

P-19 As an integral part of water system management, public awareness shall be promoted for:

- **the importance of watershed and wellhead protection;**
- **nonpoint source pollution impacts;**
- **realization of the true costs of water; and**
- **the importance of efficient water use.**

STRATEGIES

Enhance community involvement in wellhead protection initiatives.

Encourage local participation in identification and mitigation of non-point source pollution.

Involve the public in decisionmaking on major issues such as small system restructuring, withdrawal controls, new source development, and large investments in system improvements.

Carry-out on-going public education in schools and libraries.

Develop educational flyers for demand management and water conservation in water bills.

Continue to support public campaigns such as Drinking Water Week.

Keep the public informed of water system work when disruptions in service may occur.

Initiate public relations campaigns to promote public awareness of critical issues that require customer participation.

Garner public support for funding to meet new state and federal requirements.

Develop curriculums or promote contests that educate children and other consumers.

Recognize the value of public education at times other than when undergoing a rate increase.

Provide educational opportunities for water boards, PUC, and legislature.

REFERENCES

Brown, Lester R., 1996. State of the World, W.W. Norton & Co., New York.

Coyle, Kevin, 1995. "Watershed Conservation in America: The Swift River Principles," River Voices, Volume 6, Number 3.

Craft, P.A., M.A. Horn, and L. Medalie, 1990. "Estimated withdrawals and use of freshwater in RI, 1990," Report 93-4150.

Environmental Protection Agency, Office of Water, 1992. Drinking Water Handbook for Public Officials, EPA 810-B-92-016.

Environmental Protection Agency, Office of Water, 1989. General Public Notification for Public Water Systems, Washington, D.C.

Environmental Protection Agency, nd. Viability Primer for State Drinking Water Programs, Draft.

Falcone, William. RI Water Resources Board. Telephone interview, August 1997.

Frederick, Kenneth D., 1996. "Water as a Source of International Conflict, Resources for the Future, Energy and Natural Resources Division, Issue 123.

General Assembly, State of Rhode Island and Providence Plantations, 1956. General Laws of Rhode Island, Reenactment of 1993, (as amended 1996), The Michie Company, Law Publishers, Charlottesville, Virginia.

Guerrero, Peter F., 1995. Safe Drinking Water Act Reauthorization Issues, testimony of P.F. Guerrero to the General Accounting Office.

Horn, M.A., and P.A. Craft, 1991. Plan for Developing a Water-Use Data Program in Rhode Island, U.S. Geological Survey, Water Resources Investigations Report 90-4207, Providence, RI.

Johnston, Herbert E., nd. *National Water Summary -- Rhode Island, Surface-Water Resources,* U.S. Geological Survey, Water Supply Paper 2300, Providence, RI, pgs. 407-412.

Johnston, Herbert E., and Michael J. Baer, 1987. *National Water Summary 1987 -- Water Supply and Use: Rhode Island,* U.S. Geological Survey, Water Supply Paper 2350, Providence, RI, pgs. 447-452.

Johnston, Herbert E., and Paul M. Barlow, 1986. *National Water Summary 1986 -- Ground-Water Quality: Rhode Island,* U.S. Geological Survey, Water Supply-Paper 2325, Providence, RI, pgs. 443-448.

Kliever, John D., 1996. Low-Flow Characteristics of Selected Streams in Northern Rhode Island, U.S. Geological Survey Report 95-4299, Providence, RI.

Little, Arthur D., 1990. Water Supply Analysis for the State of Rhode Island, Final Report to the RI Water Resources Coordinating Council.

Maddaus, William O., 1987. Water Conservation, American Water Works Association.

New England Water Works Association, Surface Water Committee, 1995. "Resolution and Policy Concerning Recreational Use of Public Water Supplies," Final Revised Policy.

New Mexico Solar Energy Institute, nd. Saving Water -- A Handbook for Community Water Conservation.

Pawcatuck River Hydrologic Unit Area, 1995. Annual Report F/Y 1995.

Public Utilities Commission, nd. Water Task Force Report, 29 pgs.

Providence Water Supply Board, 1995. Water Quality Protection Plan, Providence, RI.

RI Department of Administration, Division of Planning, 1993. Water Emergency Response Plan for the State of Rhode Island, State Guide Plan Element 723, Report Number 81, Providence, RI.

RI Department of Administration, Division of Planning, 1992. State Guide Plan Overview, October 1992 Update and revisions through June 1993, (as amended), Report Number 80, Providence, RI.

RI Department of Administration, Division of Planning, 1991. Water Supply Plan for Rhode Island, State Guide Plan Element 722, Report 77, Providence, RI.

RI Department of Administration, Division of Planning, 1988. Water Supply Policies for Rhode Island, State Guide Plan Element 721, Report 61, Providence, RI.

RI Department of Environmental Management, 1994. The State of the State's Waters, 305 (b) Report, A Report to Congress, Providence, RI.

RI Department of Environmental Management, 1992. The State of the State's Waters, 305 (b) Report, A Report to Congress, Providence, RI.

RI Department of Environmental Management, Division of Water Resources, 1995. *Water Quality Regulations*, Draft, March 1995, Providence, RI.

RI Department of Health, Office of Drinking Water Quality, 1996. Annual Report 1995, DRAFT, Providence, RI.

RI Department of Health, Office of Drinking Water Quality, 1993. Report of the Drinking Water Quality Expert Advisory Panel, Providence, RI.

RI State Building Code, 1992. Water Supply and Distribution, SBC 3, Article 15.

The Water Source, 1996. "The 1996 SDWA Amendments Are On Board, Ready to Roll, And Drenched In Opportunities, " Volume 3, Number 1, Wilmington, MA..

U.S. Geological Survey, 1988. "Estimated Water Use in the United States", Circular 1004.

U.S. Geological Survey, nd. *U.S. Geological Survey Programs in Rhode Island*, Fact Sheet, FS-039-95.

Vogel, R.M., and D.I. Hellstrom, 1988. "Long-Range Surface Water Supply Planning," Civil Engineering Practice.

Westerly Water Department, 1994. Water Supply Management Plan, Westerly, RI.

APPENDIX A

DEFINITIONS

Terminology is significant in water supply planning. Confusion may occur during a discussion that relies on the acceptance of a premise or implied meaning of a key term. It is important to establish consensus and consistency in the way terms are used. While any attempt to list terms will always be incomplete, the following appear to be the most troublesome and subject to interpretation based on their particular context.

Abandoned water supply sources - sources that are no longer used or maintained; they are permanently disconnected surface waters or wells.

Active water supply sources - RI Department of Health-approved sources of supply connected to a water supply system and available for distribution; these sources may be surface waters or wells.

Advisory Committee - the Water Supply Policies Advisory Committee appointed by the State Planning Council for the purpose of updating State Guide Plan Element 721, *Water Supply Policies for Rhode Island* (1988).

Back flow - hydraulic condition caused by a difference in pressures, in which non-potable water or other fluids flow into a potable water system.

Best Management Practices (BMP's) - A method, measure, or practice that, when correctly installed or performed, will prevent, reduce, or minimize water pollution.

Community water system - a public water system that pipes water for human consumption to at least 15 service connections, or one that regularly serves at least 25 year-round residents (e.g., municipality, subdivision, mobile home park).

Conservation - methods, procedures, and devices designed to promote efficient use of water and to eliminate waste.

Consumption - all water delivered by water suppliers for its intended use for industrial, commercial, agricultural, residential or other uses.

Cross-connection - any arrangement of pipes, fittings, fixtures, or devices that connects a non-potable system to a potable water system.

Cross-connection control - prevention of the return of water, or the backflow of possibly contaminated water, into the water supply system.

Demand management- any conscious effort to modify water use; the best utilization of existing supply.

Distribution facilities - the pipes and appurtenant facilities utilized to deliver, dispense, or circulate retail potable water to consumers.

Drawdown - a decline in groundwater levels due to pumping.

Drought - a condition of dryness due to lower than normal precipitation. For water supply purposes drought is associated with safe yield especially for conditions where a system can not be replenished and failure is anticipated.

Emergency water supply sources - not regular sources of supply but supplies held in reserve for use in emergencies. The use of emergency water supply sources must be approved by the RI Department of Health; these may be surface waters or wells.

Groundwater - water below the surface of the ground, usually refers to water in the saturated zone.

Inactive water supply sources - water sources that are physically disconnected, no longer used or maintained.

Interconnection - any arrangement of pipes, fittings, fixtures, or devices that connects two potable water systems.

Major user - any public or private organization or entity using more than 3 million gallons of water per year (lower thresholds may apply for individual water suppliers).

Major water supplier - all municipalities, municipal departments and agencies, districts, authorities or other entities engaged in or authorized to engage in the supply, treatment, transmission, or distribution of drinking water on a wholesale or retail basis, which obtain, transport, purchase, or sell more than fifty million (50,000,000) gallons of water per year.

Multiple use - refers to competition for water and the many uses, users, and related stresses placing demands on water supply sources which may include commercial, industrial, residential, agricultural, and recreational uses.

Non-account water - system-wide water loss through leaks, under registering meters, or water theft that takes a financial toll on utility operation.

Non-community water system - a public water system that pipes water for human consumption to at least 15 service connections, or serves 25 or more people at least 60 days a year (e.g., schools, factories, restaurants).

Non viable system - a water system without the financial, technical, or human resources to maintain a safe water supply.

Performance standards - legally enforceable environmental and design requirements for activities conducted in a regulated area. Essentially the same as BMP's which are developed for specific activities to protect specific resources.

Potable water supply - any water used or intended to be used for drinking, bathing, culinary, or other personal purposes that meets current state and federal drinking water standards.

Primacy - primary responsibility for implementing and enforcing federal laws and regulations that are delegated to the state from the federal government.

Public water system - a system that provides piped water for human consumption if such system has at least 15 service connections or regularly serves an average of 25 individuals 60 or more days of the year. Such a system includes any collection, storage, treatment, pre treatment storage, and distribution facility used primarily in connection with the system. A public water system is either a community or a non-community system and can be publicly or privately owned.

Safe Drinking Water Act (SDWA) - the federal legislation of 1974, amended in 1986, and reauthorized in 1996, to establish standards for drinking water safety.

Safe yield - a sustainable withdrawal that can be continuously supplied from a water supply source without adverse effects throughout a critical dry period with a 1 percent chance of occurrence, or one that is equivalent to the drought of record, whichever is worse.

Safe yield (aquifer or well) - the rate at which groundwater can be withdrawn without producing unacceptable or undesirable effects such as drawdowns or changes in water quality.

Sanitary survey - an on-site review, evaluation, and/or inspection of the water source(s), facilities, equipment, operations, and maintenance of a public water system for the purpose of determining its adequacy for producing and distributing safe drinking water.

Service area - the geographic boundary within which service connections to customers of a water supply system are committed by charter of the water commission, board, or authority.

Small system - any public water system serving fewer than 3,300 people.

Sole source aquifer - the only practicable water supply for a geographic region that is composed of sand, gravel, or rock and is capable of storing or conveying appreciable quantities of water below the surface of the land.

State revolving fund (SRF) - a revolving loan fund capitalized by grants from the federal government. States are required to match federal grants and use their revolving fund to make loans to local governments and water suppliers.

Transmission facilities - the pipes, pumping stations, and storage facilities required to carry high volumes of potable water from a water source to the distribution facilities, or throughout an area for the purpose of supplying water to the general population, or wholesale customers.

Unaccounted-for water - water that is pumped from the treatment plant into the distribution system but which is not delivered to consumers or otherwise accounted for.

Viability - the ability of a water system to sustain the financial, managerial, and technical resources to operate, maintain and manage a public water system in full compliance with federal and state regulations.

Water supplier - any municipality, municipal department, agency, district, authority, or other private entity engaged in or authorized to engage in the supply, treatment, transmission, or distribution of drinking water to at least 15 service connections, or an average of 25 persons, 60 or more days of the year.

Water Supply Management Plan (WSMP) - a comprehensive water supply plan required of major water suppliers involved in the supply, transmission, and/or distribution of drinking water. Requirements to prepare, maintain, and carry out a WSMP are described in the state law and regulations.

Temporarily inactive water supply sources - seasonal sources of supply, or sources temporarily not in use due to mechanical failure, quality problems, or lack of demand. These sources may be surface waters or wells and, depending on the reason for their status, must have Department of Health approval prior to use.

Watershed - an area of land draining to a common outlet.

Water system - any combination of interconnected sources and facilities used for supplying potable water; water systems are owned and operated by water suppliers.

Wellhead Protection Area (WPA) - the surface and subsurface area surrounding a public drinking water well through which contaminants are reasonably likely to move toward and reach the wellhead. Commonly called "well field" or "recharge area".

Acronyms and Abbreviations

AWWA	American Water Works Association
BMP	Best Management Practice
CERCLA	Comprehensive Environmental Response, Compensation, Liability Act
CWA	Clean Water Act
CWI	Clean Water Infrastructure Replacement Plans
CWPFA	Clean Water Protection Finance Agency
DEM	(RI) Department of Environmental Management
DOH	(RI) Department of Health
DOP	(RI) Division of Planning
EPA	Environmental Protection Agency
GIS	Geographic Information System
ISDS	Individual Sewage Disposal System
LUST	Leaking Underground Storage Tank
MCL	Maximum contaminant level
MGD	Million gallons per day
MUTAP	Major Users Technical Assistance Program
NEIWPCC	New England Interstate Water Pollution Control Commission
NRCS	(USDA) Natural Resources Conservation Service
RCRA	Resource Conservation and Recovery Act
RIDEM	RI Department of Environmental Management
RIDOH	RI Department of Health
RIDOP	RI Division of Planning (Department of Administration)
RIGIS	RI Geographic Information System
RIGL	RI General Law
RIPDES	RI Pollution Discharge Elimination System
RIWRB	RI Water Resources Board
SCS	Soil Conservation Service (see NRCS)
SDWA	Safe Drinking Water Act
SGP	State Guide Plan
SIC	Standard Industrial Classification
SPC	State Planning Council
SRF	State Revolving Fund
SWTR	Surface Water Treatment Rule
SPP	Statewide Planning Program a/k/a RI Division of Planning
UIC	Underground Injection Control
USGS	United States Geological Survey
UST	Underground Storage Tank
VOC	Volatile organic compound
WPA	Wellhead Protection Area
WHPP	Wellhead Protection Program
WRB	(RI) Water Resources Board
WSMP	Water Supply Management Plans
WWMD	Wastewater Management District

APPENDIX B

LEGISLATIVE RESPONSIBILITIES OF THE RI DIVISION OF PLANNING

42-11-10. Statewide planning program. *(as amended 1996)* **---** (a) *Findings.* The general assembly finds that the people of this state have a fundamental interest in the orderly development of the state; the state has a positive interest and demonstrated need for establishment of a comprehensive strategic state planning process and the preparation, maintenance, and implementation of plans for the physical, economic, and social development of the state; the continued growth and development of the state presents problems that cannot be met by the cities and towns individually and that require effective planning by the state; and state and local plans and programs must be properly coordinated with the planning requirements and programs of the federal government.

(b) *Establishment of statewide planning program.* (1) A statewide planning program is hereby established to prepare, adopt, and amend strategic plans for the physical, economic, and social development of the state and to recommend these to the governor, the general assembly, and all others concerned.

(2) All strategic planning, as defined in subsection (c), undertaken by the executive branch for those departments and other agencies enumerated in subsection (g), shall be conducted by or under the supervision of the statewide planning program. The statewide planning program shall consist of a state planning council, and the office of strategic planning and the office of systems planning of the division of planning, which shall be a division within the department of administration.

(c) *Strategic planning.* Strategic planning includes the following activities:

(1) Establishing or identifying general goals.

(2) Refining or detailing these goals and identifying relationships between them.

(3) Formulating, testing, and selecting policies that will achieve desired objectives.

(4) Preparing long-range or system plans or comprehensive programs that carry out the policies and set time schedules and targets.

(5) Preparing functional short-range plans or programs that are consistent with established or desired goals, objectives, and policies, and with long-range or system plans or comprehensive programs where applicable, and that define intermediate steps toward their accomplishment.

(6) Monitoring the planning of specific projects and designing of specific programs of short duration by the operating departments and other agencies of the executive branch to insure that these are consistent with and carry out the intent of applicable strategic plans.

(7) Reviewing the execution of strategic plans and the results obtained and making revisions necessary to achieve established goals.

(d) *State Guide Plan.* Components of strategic plans prepared and adopted in accordance with this section may be designated as elements of the state guide plan. The state guide plan shall be comprised of functional elements or plans dealing with land use; physical development and environmental concerns; economic development; human services; and other factors necessary to accomplish the objective of this section. The state guide plan shall be a means for centralizing and integrating long-range goals, policies, and plans. State agencies concerned with

specific subject areas, local governments, and the public shall participate in the state guide planning process, which shall be closely coordinated with the budgeting process.

(e) *Membership of state planning council.* The state planning council shall consist of:

(1) The director of the department of administration as chairperson;

(2) The director, policy office, in the office of the governor, as vice-chairperson;

(3) The governor, or his or her designee;

(4) The budget officer;

(5) The director of the office of housing, energy and intergovernmental relations;

(6) The associate director of administration for planning, as secretary;

(7) The president of the league of cities and towns or his or her designee and one official of local government, who shall be appointed by the governor from a list of not less than three (3) submitted by the Rhode Island league of cities and towns; and

(8) The executive director of the league of cities and towns;

(9) The speaker of the house or his or her designee;

(10) The senate majority leader or his or her designee;

(11) Four (4) public members, three (3) who shall be appointed by the governor, and one of whom shall be appointed by the speaker of the house for terms of three (3) years.

(f) *Powers and duties of state planning council.* The state planning council shall have the following powers and duties:

(1) To adopt strategic plans as defined in this section and the long-range state guide plan, and to modify and amend any of these, following the procedures for notification and public hearing set forth in § 42-35-3, and to recommend and encourage implementation of these goals to the general assembly, state and federal agencies, and other public and private bodies; approval of strategic plans by the governor;

(2) To coordinate the planning and development activities of all state agencies, in accordance with strategic plans prepared and adopted as provided for by this section;

(3) To review and comment on the proposed annual work program of the statewide planning program;

(4) To adopt rules and issue orders concerning any matters within its jurisdiction as established by this section and amendments thereto;

(5) To establish advisory committees and appoint members thereto representing diverse interests and viewpoints as required in the state planning process and in the preparation or implementation of strategic plans. The state planning council shall appoint a permanent committee comprised of:

(i) public members from different geographic areas of the state representing diverse interests, and

(ii) officials of state, local and federal government, which shall review all proposed elements of the state guide plan, or amendment or repeal of any element thereof, and shall advise the state planning council thereon before the council acts on any such proposal. This committee shall also advise the state planning council on any other matter referred to it by the council; and

(6) To establish and appoint members to an executive committee consisting of major participants of a Rhode Island geographic information system with oversight responsibility for its activities.

(g) *Division of Planning.* (1) The division of planning shall be the principal staff agency of the state planning council for preparing and/or coordinating strategic plans for the comprehensive management of the state's human, economic, and physical resources. The division of planning shall recommend to the state planning council specific guidelines, standards, and programs to be adopted to implement strategic planning and the state guide plan and shall undertake any other duties established by this section and amendments thereto.

(2) The division of planning shall maintain records (which shall consist of files of complete copies) of all plans, recommendations, rules, and modifications or amendments thereto adopted or issued by the state planning council under this section. The records shall be open to the public.

(3) The division of planning shall manage and administer the Rhode Island geographic information system of land-related resources, and shall coordinate these efforts with other state departments and agencies, including the University of Rhode Island, which shall provide technical support and assistance in the development and maintenance of the system and its associated data base.

(h) *Transfer determinations.* (1) The director of administration, with the approval of the governor, shall make the conclusive determination of the number of positions, personnel, physical space, property, records, and appropriation balances, allocations and other funds of the department of mental health, retardation, and hospitals, department of health, department of human services, department of corrections, department of labor, department of environmental management, department of business regulation, department of transportation, department of state library services, Rhode Island Economic Development Corporation, department of elderly affairs, department for children and their families, historical preservation commission, water resources board, and the defense civil preparedness/emergency management agency of the executive department to be transferred to the department of administration in connection with the functions transferred there into by the provisions of this article.

(2) In order to ensure continuity of the strategic planning process of the department specified heretofore, the actual transfer of functions or any part thereof to the department of administration may be postponed after July 1, 1985 until such time as, by executive order of the governor, the transfer herein provided can be put into force and effect but no later than December 31, 1985.[52]

Reinforcing the role of the Statewide Planning Program, Sections 46-15-13 and 46-15-14 of the General Laws designate the division of planning as responsible for long-range water supply planning and planning for water emergencies. The full text of these sections is as follows:

46-15-13. Water supply planning. --- The division of planning shall study and evaluate the needs of the state for current and future water supply and shall have the following powers:

(1) To formulate and maintain a long range guide plan and implementing program for development of major water resources and transmission systems needed to furnish water to

[52] History of Section. P.L. 1978, ch. 228 § 1; P.L. 1985, ch. 181, art. 29, § 1; P.L. 1988, ch. 129, art. 19, § 2; P.L. 1989, ch. 126, art. 49, § 1; P.L. 1990, ch. 235, § 1; P.L. 1990, ch. 309, § 1; P.L. 1990, ch. 361, § 1. Compiler's Notes. In 1994, the compiler made minor stylistic and punctuation changes. In 1996, the compiler substituted "labor and training" for "labor" in subsection (h)(1).

regional or local public water systems as part of the state guide plan adopted pursuant to Section 42-11-10.

(2) To provide for cooperative development, conservation, and use of water resources by the state, municipal agencies or departments, water resources board, and public water systems, including special water districts and privately owned public water systems, the division of planning may:

(i) Divide the state into areas for the purpose of providing water supply facilities;

(ii) Designate municipal water departments or agencies, special districts, or privately owned public water systems to perform area-wide water supply operations within each area.

(3) To review all plans and proposals for construction or installation of facilities for water supply conformance with the state guide plan in accordance with Section 46-15-2 and report its findings to the water resources board.

46-15-14. Emergencies and imminent hazards. **---** The division of planning, subject to the approval of the governor, shall promulgate an adequate plan for the provision of safe drinking water for the inhabitants of the state when a water emergency has been declared by the governor. A water emergency shall include situations in which water supplies are insufficient to meet the needs of the inhabitants of the state either through a water shortage or contamination of water supplies. In a water emergency, the governor may take such actions and issue such orders as may be necessary to implement the plan, including the imposition of conservation measures and the allocation of water supplies. The actions and orders may be directed to state agencies, municipalities, or entities engaged in the sale of water to the public. Notwithstanding the foregoing, the responsibility for setting rates for the purchase and sale of water shall not be affected by this section.